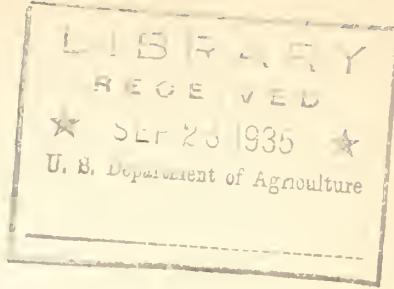


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VOLUME I

FEBRUARY CONFERENCE

SOIL EROSION SERVICE AND E.C.W. ENGINEERS

PROCEEDINGS AND RECOMMENDATIONS

OKLAHOMA CITY, OKLAHOMA.



Those in Attendance at Engineers Meeting.

Oklahoma City, February 5-6-7, 1935

T. E. Chambers, SES  
Washington, D. C.

H. H. Hardeman, SES #1, Engr. ECW  
Minden, Louisiana

W. F. Beaman, SES  
Washington, D. C.

Floyd S. Edmiston  
Chief Agri. Engineer, SES #15  
Mindens, Louisiana

Sam A. Nixon, ECW  
Temple, Texas

Hans F. Jepson  
Acting Chief Engineer, SES #13  
Spencer, West Virginia

Howard Matson, SES  
Lindale, Texas

Harold M. Rhodes  
Engineer, ECW  
Spencer, West Virginia

L. H. Schoenleber, SES  
Bethany, Missouri

Vincent McKeever  
Engineer, ECW  
Spencer, West Virginia

G. E. Ryerson, SES  
LaCrosse, Wisconsin

Robert H. Vahrenkamp  
ECW Engineer  
Lindale, Texas

Maunsell Gabbott, ECW  
Dadeville, Alabama

Lewis K. Black  
Planning Engineer, ECW  
Elm Creek Project  
Temple, Texas

James H. Wood, ECW  
Camp Hill, Alabama

D. B. Krimgold  
In charge of Hydrological Data, Si  
Washington, D. C.

Frank Gaines, ECW  
Gainesville, Alabama

Henry A. Dyer  
Assistant Agri. Engineer, SES #5  
Spartanburg, South Carolina

John R. Carreker, SES  
Dadeville, Alabama

G. M. Clarke  
Assistant Chief Engineer  
Washington, D. C.

Eugene C. Meyer, ECW  
Coon Valley, Wisconsin

E. N. Getlive, SES #17  
Conway, Arkansas

Burton Dicks, Rep. of the  
Clarence L. Boyd Co.  
Guthrie, Oklahoma

R. M. Quertermous, ECW #17  
Conway, Arkansas

Harley S. Griner  
% J. D. Adams Company  
Indianapolis, Indiana

W. A. Cost  
% J. D. Adams Company  
Indianapolis, Indiana



- Chas. M. Stokes  
Chief Agri. Engineer  
Project #25  
Safford, Arizona
- E. G. Johnson  
Chief Agri. Engineer  
Project #14  
Zanesville, Ohio
- F. D. Matthews  
Project #10  
Ass't Regional Director  
Albuquerque, New Mexico
- J. G. Barnesburger  
Project #7  
Chief Agri. Engineer  
Santa Barbara, California
- Ray S. Garberry  
Proj. #7, Superintendent  
Army Geodetic Survey  
California
- C. C. Johnson, SES  
Pullman, Washington
- R. W. Oberlin, SES  
Bethany, Missouri
- John G. Glass, SES  
Mankato, Kansas
- C. W. Hayler, ECW  
Mankato, Kansas
- G. L. Ellithorpe, ECW  
Mankato, Kansas
- Wilbur E. Laird, ECW  
Mankato, Kansas
- H. E. Lary, SES  
Athens, Georgia
- H. M. Wallace, Jr., SES  
Stillwater, Muskogee, Okla.
- Harold W. LeMert, SES  
Shenandoah, Iowa
- H. E. Bergschneider, SES  
Stillwater, Oklahoma
- Virgil Overholt, ECW  
Agri. Extension Eng., Ohio
- E. S. Abele, ECW  
Zanesville, Ohio
- B. C. Corwin, ECW  
Zanesville, Ohio
- R. W. Noon  
Continental Equipment  
Chicago, Illinois
- Arthur W. Turner  
International Harvester  
Chicago, Illinois
- L. W. May, Superintendent  
S. J. L.  
Athens, Georgia
- G. M. Douglass, ECW 1861  
Stillwater, Oklahoma
- J. H. Wheatley, Jr.  
ECW - SES #2  
Stillwater, Oklahoma
- D. T. Markham  
ECW - SES #2  
Stillwater, Oklahoma
- Earl Vactor, ECW  
SES WI  
Washington, D. C.
- C. W. Bennett, ECW  
Gila River Project #25  
Safford, Arizona
- R. E. Witherell, SES  
Gila River Project  
Safford, Arizona
- H. M. Ellis  
Ass't Agri. Engineer  
High Point, North Carolina  
(Deep River Project)



B. L. Taylor  
Agri. Engineer  
Meridan, Mississippi

R. L. Hoover  
Okla. Truck Company  
Oklahoma City, Okla.

Robert W. Stratton  
District Representative  
Cleveland Tractor Co.  
Cleveland, Ohio

Ben Harrison  
Farm Conservation Work  
Rural Rehabilitation Dept.  
Oklahoma

Toge Sturdivante  
Acting Asst. Exten. Agri.  
Engineer of Oklahoma.

Marion W. Clark  
Assistant Agri. Engineer, SES  
Bethany, Missouri

Carl J. Lowry, SES  
Sherandoah, Iowa

Dwight D. Smith, SES  
Bethany, Missouri

O. C. Wilson  
Austin-Western Read Machinery Co.  
Aurora, Illinois

G. F. Hoover  
Cleveland Tractor  
Cleveland, Ohio

Marshall West  
District Representative  
Cleveland Tractor Co.  
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Dallas, Texas

B. F. Dyer, ECW  
Project No. 22  
Chatham, Virginia

J. R. Maher, SES  
Project #2  
Bethany, Missouri

Don S. Wilson, ECW  
Project #2  
Shenandoah, Iowa

E. A. Schuch, SES  
Washington, D. C.

J. M. Downing  
Project #30  
Rock Hill, S. C.

W. T. Linton, ECW  
Camp Engineer  
Project #5  
Spartanburg, S. C.

F. Caldwell Jones  
Superintendent, S.C. SES 3  
ECW  
Route 1  
Taylors, S. C.

H. E. Engstrom  
Agricultural Engineer SES  
Albion, Nebraska

Ralph Reid  
ECW Engineer  
Albion, Nebraska

E. R. Kinnear  
Chief Agricultural Engineer  
Albion, Nebraska

F. C. Taylor  
ECW Engineer  
Paxton Springs, Illinois

W. L. Yarger  
ECW Engineer  
Congerville, Illinois

Fred S. Reynolds  
Agricultural Engineer  
Palhart, Texas



- C. W. Chapman  
Assistant Agri. Engineer  
Athens, Georgia
- H. O. Hill  
Chief Agri. Engineer  
Temple, Texas
- H. L. Cook  
Hydraulic Engineer  
Washington, D. C.
- H. R. Murphy  
Caterpillar Tractor Co.  
Peoria, Illinois
- A. E. Burns  
ECW Engineer  
Santa Paula, California
- H. R. McConnell  
ECW Engineer  
Ventura, California
- J. Dale White  
SES  
Galva, Illinois
- Reid Evans, SES  
Assistant Agri. Engineer  
Illinois Area  
LeRoy, Illinois
- Carl R. Olson, SES  
Assistant Regional Director  
Urbana, Illinois
- Alvin J. Thompson  
Inspector, ECW  
Washington, D. C.
- M. F. Ensminger  
Illinois Area  
LeRoy, Illinois
- J. T. McAlister  
Ch. Agri. Engineer  
Spartanburg, S. C.
- J. W. Carpenter, Jr.  
Chief Agri. Engineer  
Meridian, Mississippi
- J. W. Slosser  
Agri. Engineer, State of Okla.  
Guthrie, Oklahoma
- H. S. Riesbol  
Associate Agri. Engineer  
Bureau of Ag. Engr. U.S.D.A.  
Guthrie, Oklahoma
- M. L. Noel  
Assistant Industrial Sales Mgr.  
Allis Chalmers Mfg. Co.  
Milwaukee, Wisconsin
- H. G. Lewis  
Superintendent Red Plains Erosion  
Station - U. S. D. A.  
Guthrie, Oklahoma
- H. M. Elwell  
Assistant Agronomist in Soil  
Conservation Station, U.S.D.A.  
Guthrie, Oklahoma
- Donald Christy  
Assistant Agri. Engineer  
Brown Creek  
Wadesboro, North Carolina
- E. R. Smith  
Supt. ECW Camp  
Stillwater, Oklahoma
- Purl Sanders  
ECW Superintendent  
Stillwater, Oklahoma
- E. R. Fancy  
Chief Engineer, SES  
High Point, N. C.
- C. E. Ranser  
U. S. Dept. of Agriculture  
Guthrie, Oklahoma



300 MINUTES ON CONFERENCE OF ENGINEERS OF SOIL EROSION SERVICE AND  
E.C.W.

Tuesday, February 5, 10:30 a.m.

Meeting called to order by Mr. T. B. Chambers

Mr. Chambers explains the absence of Major B. P. Fleming and introduces

Mr. Charles N. Stokes, Chief Agricultural Engineer at Safford, Arizona.

Mr. Stokes:-

"Mr. Chairman, gentlemen -

We will hope that this will be one of the occasions where a bad beginning will make a good ending. It is certainly disappointing to you gentlemen to come here expecting to hear Major Fleming who is capable of delivering an excellent address and have to come and listen to a few remarks from a person like myself. However, I will endeavor to be brief.

The Chief wishes me to extend very sincere regrets for not being able . . .  
to be present today. He had been planning on it all winter. He had promised to deliver an address tomorrow at the University at Tucson and I believe it was a date he had postponed several times and felt that he must keep it. There is no one more than the Chief who appreciates the value of this meeting. He thinks that this is of great importance in helping to correlate the work as well as the personal touch and adding a great deal to the future. I am going to give you one or two points of scientific nature which I believe apply to all sections of the country, that is the action of silt carrying water particles at high velocity. He is convinced that the quantity and reaction of water under those conditions are very different from those of clear water and he feels that some experiments should be initiated to determine those problems and the loss covering water under those conditions. Probably the design of the apparatus and the conducting of those experiments



will require a great deal of thought and investigation to make them of value to us in the field.

Another thought Major Leming always has in mind is that as long as our work is experimental it should be so conducted that the men who we hope are going to follow our example will be able within the demonstrational area to carry on with the methods that we on the demonstration project are showing them. In other words, he feels that for the sake of economy we should build the majority of the terraces with tractor equipment but you should show the farmers they could build successful terraces with mule power, maybe at a little more cost so he can follow this up.

He thinks particularly since Government aid is being extended to so many classes of people and in many quarters, there is quite a little feeling that Uncle Sam is showing us how to do it, let him do it. But that is not the idea on which the Soil Erosion Service is founded. It is the idea that it should be a demonstration which the farmer can pick up with his own equipment on his own property. This cannot be said of the eastern projects which are largely on public land. One more thought. The Chief also thinks that for the ordinary farmer is a little hard for him to get the true point of view in connection with soil erosion work. We are taught at college and by experimentation that we should build for permanency and strength. He should make structures that will last as should highways, bridges, etc., which are built to be of a permanent nature. He rather feels that in this work we are doing only a minor part. We are trying to correct a condition man induced where we have upset the balance of nature and the correction must be 95% to 99% natures work. All we can do is aid in a small way and keep in mind that the structures that we are building



in starting nature's conditions are very much like the forms and scaffolds that we may put up in building one of our permanent structures.

In this case we do not do the final work, nature will do the rest in executing the cure. The Chief therefore feels that although our work should be of permanent stability in any case the results will be accomplished in a very few years. Silting occurs very rapidly within a year or two and our function is not necessarily to put in permanent work with sufficient stability to last until the time required for nature to effect a cure. He feels that it is an extremely important fact in what we do to fulfill our functions in the right way till erosion has run its course.



Mr. Chambers:

"Gentlemen: We are sincerely sorry that Major Fleming was not able to attend this meeting. I am sure that we will all miss his advice and counsel during the course of our discussions. We feel that Major Fleming sent an able representative in the person of Mr. Stoker and I am sure that everyone enjoyed his talk.

I feel that all of us appreciate the opportunity of gathering here for this conference. It is an unusual opportunity to discuss our problems and air our views on matters in which we are vitally interested. We are particularly glad to be able to meet with the Engineers from the E.C.W. camps. Our work is so closely related that it is often impossible to distinguish between the two. I also wish to take this opportunity to welcome our visitors representing other Government or State agencies and the representatives of private companies. We trust that all of you will feel free to enter into our discussions and we will appreciate having your advice or criticisms at any time. I am sure that all members of the Soil Erosion Service and E. C. W. join me in extending to you a hearty welcome.

The purposes and objectives of this meeting have been outlined to you in a memorandum. It might be well at this time to read these objectives in order that they be kept clearly in mind:

1. To give the personnel a broader, more comprehensive understanding of the problems confronting the Engineers over the entire scope of areas being worked by the Soil Erosion Service.

2. To discuss those problems at a joint meeting for the purpose of crystalizing thought regarding various means of attacking them; to recommend definite measures of procedure that a more logical and unified program may be undertaken.



To achieve these ends the following procedure has been scheduled:

Papers from various projects outlining conditions found in the major land and climate subdivisions of the United States will be presented. After presentation a general discussion will be held for the purpose of clarifying ideas, presenting new ideas, calling attention to omissions, correcting errors, and otherwise presenting thoughts that seem pertinent, with the view of obtaining, if possible, the best method of procedure to be followed along similar lines in this and in the other major subdivisions of the country. In addition to these, educational papers prepared by specialists will be presented on several phases of the work which are of vital interest to the personnel.

As a further means of securing definite recommendations and new thought along various lines in which we are interested, standing committees have been appointed which will consider the information presented in the papers and discussions. Regular committee meetings will be held and reports made to the general meeting for its consideration. The committee of the whole will consider recommendations of the standing committees and its recommendations will represent the action of the conference. The final recommendations of the committee of the whole should serve as a guide for establishing practices in the various lines on all of the projects of the Soil Erosion Service in so far as local conditions will permit.

I believe these objectives are clearly stated. Please keep them in mind in order that the discussions here and in committee meetings may be turned towards arriving at these objectives. It is the desire of Mr. Bennett and Dr. Lowdermilk that definite conclusions and specific recommendations be made as a result of this conference.

It is possibly not out of order for me to make some remarks concerning the duties of the Engineers of the Soil Erosion Service. To us, as Engineers, our part in this program seems of most importance. This is as it should be and according to human nature. I have yet to meet a more earnest, conscientious, and diligent group of workers than you Engineers of the E.C.W. and Soil Erosion Service. At the same time we must not



forget that the other technical branches of our organization feel the same way with respect to their work. We must respect their feelings as we would have ours respected and work in cooperation with the other branches at all times. I would sincerely urge you to maintain a co-operative spirit with all other branches of the Soil Erosion Service and all other agencies engaged in erosion control work. I believe that we may list "Cooperation" as the first duty of our Engineers.

As in all engineering construction work you are engaged as agents in the expenditure of funds. It may be said that you must serve two masters, the Government on one hand who is furnishing the funds, and the Public on the other hand for whose benefit they are expended. It is our duty, of course, to handle this work in the most economical manner possible that each may receive the maximum benefits from the expenditure. Every effort should be made to keep the work on a practicable, sound, economical basis. To this end, I believe, that some correlation is necessary between the value of the land on which we are working and the value of the improvements. As an example: it is quite evident to me that more expenditure is justifiable to prevent gullies from cutting into valuable agricultural lands than to attempt to control gullies after they have succeeded in ruining lands for agricultural purposes. By the same reasoning it is more important to prevent the loss of fertile top soil from large areas than to try to bring back to a state of fertility lands on which the top soil has been removed by erosion. Further thought along this line would indicate to all of us that in order to keep our work on a high practicable basis we must keep abreast of the times to acquaint ourselves with new and improved methods that are being so rapidly developed by our own men and by those employed by other agencies engaged



in similar lines of work. To this end, I believe, that each of you should study his own problems carefully and should report to the Washington office any proven methods that are superior to those ordinarily used.

In conclusion, I would like to remind you that Soil Erosion Service work is in its infancy. We are in somewhat of an experimental stage at the present time. It is possible that future policies of the Government with respect to Soil Erosion work will be based on the work being done by the Soil Erosion Service and other erosion agencies. This is a further reason for keeping our work on a practical basis.

I will now read the names of the various Committees and the names of those appointed to each:

COMMITTEE ON GULLY CONTROL

J. T. McAlister	H. Wheatley (ECW)	Charles M. Stokes
M. E. Ensminger	D. D. Smith	A. J. Thompson (ECW)
C. E. Johnson	J. D. Mathews	B. Krimgold
	Barney R. Hodgin	

COMMITTEE ON TERRACE DESIGN AND CONSTRUCTION

John W. Carpenter, Jr.	H. A. Dyer	G. F. Ryerson
Eugene N. Gatlin	J. L. Downing	E. R. Baney
N. Wilson	John V. Glass	F. S. Edmiston
	Henry E. Bereschnider	John R. Carricker

COMMITTEE ON TERRACE OUTLET DESIGN, CONSTRUCTION & PROTECTION

Earl G. Johnson	C. R. Olson	R. C. Oberlin
John S. Glass	R. E. Dyer	Howard Matson
H. O. Hill	H. L. Cook	Howell D. Larey
James K. Alvis		H. M. Wallace, Jr.

COMMITTEE ON DRAFTING, MAPPING AND PHOTOGRAVIMETRY

W. F. Beaman	F. G. Schuch	Hans Jepsen
John G. Barnesberger	H. M. Ellis	E. R. Kinnear
	F. S. Reynolds	



These committees will please pay particular attention to those discussions pertaining to their subjects. At the regular Committee meetings you will consider the agenda which has been submitted and any other questions related to your work. When your Committees have made their recommendations they will be considered by the Committee of the whole and its recommendations will be considered as the conclusions of this conference.

I thank you."



Mr. Chambers:-

"We will now start right into the papers. The first paper will be "Gully Control as Related to Illinois and the Middle West" by Mr. M. E. Ensminger, Chief Erosion Specialist, of the Illinois Project. These papers were designed to portray various soil and climatic conditions in the country. Mr. Ensminger from the Middle West has very different conditions than Mr. McAlister from the Southeast. We have a paper from each and we know they will be very interesting to the entire meeting. To back up what Mr. Carpenter said, we are glad to have the implement men here with us and we are sure we can get a lot of information from them. We will be glad to have them sit in the Committee meetings. We shall also be glad for them to enter into any of the discussions they see fit. We will now hear from Mr. Ensminger."

Mr. Ensminger:-

"As a word of preparation to this paper I might say that the original Illinois area consisted of 140,000 acres. The average drainage area is large but as you get into the outlying areas it is not uncommon for you to find a two or three acre watershed. The average cost per acre in the Illinois area has been \$2.40. At the close of this paper I will present some slides to illustrate points brought out in the paper."

Mr. Ensminger presents paper on "Gully Control as Related to Illinois and Middle West" and slides:

.....



Mr. Chambers:-

"I wish to thank Mr. Ensminger for presenting a very able paper in a very able way. I am sure we got a lot of interesting information. I would like to ask Mr. E. G. Johnson of the Ohio project to enter into a brief discussion of this paper."

Mr. E. G. Johnson:-

"I asked Mr. Chambers what he wanted me to do and he said the thing to do was to start an argument. All of us engineers enjoyed Mr. Ensminger's paper very much. There is one thing that occurs to me in this work and that is all of us are thinking about definite types of drainage areas and drainage conditions. I think the paper certainly gives us somet'ing to think about and a basis for considerable discussion. I am going to proceed on the basis of raising some questions. You men give your ideas on these points."

Q. "On the various types of structures should we have a definite correlation between the quantity of runoff and the type of structure?"

A. "It will depend as much upon soil type as the drainage area."

Q. "Should not grade also be considered?"

Comment: "My opinion is that it is going to finally come down to a matter of second feet actually going over the dam which the velocity will be expected to handle."

A. "Second feet going over the dam will be a factor."

Mr. Johnson: "We have already raised the question as to when gully control work should be practiced. Is there anyone here who will attempt to state a rule? In other words, are we ever justified in considerably exceeding the value of the land?"



Q. "What standard of land value would you accept on that?"

Q. "Tax records or a legal appraisal?"

Mr. Johnson: "Yes, something like that, tax records or a legal appraisal."

Comment: "If you take it at the present time land which has sold for \$300 per acre now is valued at \$20 to \$25 per acre in some cases. So you might spend 50% of the value of the land at present whereas three years from now the land will be much more valuable."

Comment: "The Federal Land Bank might be a good standard."

Comment: "I think another answer to your question would be the possibility of saving the land below from silting up."

Comment: "Where erosion has taken place you do not have to work very long to exceed the land value."

Mr. Chambers: "May I bring in here the thought behind that question was: Are we justified in doing more work on land worth \$100 per acre than we are on land worth \$2 per acre. We should work out a basis and state in a general way what the value of the work we are doing would be with relation to the value of the land. In working in gullied land, the land is already partially ruined and the first thing we have to do is to keep them from going into the lands above and keep them from depositing silt and infertile materials on the lands below that have not been destroyed."

Mr. Carpenter: "In fact, the conditions so vary that above all the rule that you can lay down is to suggest that a man consider very carefully and does not spend too much money."

Mr. Johnson: "I would like to raise a question in regard to temporary structures. What do you think the height should be for a temporary structure with a life of 3 to 5 years?"



Mr. Carpenter: "It depends on whether you are going to put trees or sod in that gully. In conditions of vegetation or trees it seems to me a definite height should be maintained. That should also be related to the size of the watershed, and the value of water that must be handled through it."

Mr. Johnson: "With a very large watershed you would not be justified in having as large a drop as you would in a small one. Soil type will also be a factor. It is a very difficult thing to set any definite rules."

Mr. Johnson: "Regarding the vertical interval between structures. What various ranges do we have on which we can have a 2% gradient or can we exceed that considerably? I suppose that has to depend again on the soil type, the physical condition, and the quantity of water that is to be taken care of."

Comment: "I note on the sample sheet there was a 1 to  $2\frac{1}{2}\%$ ."

Comment: "That particular one was in the watershed. That one ran about 2%."

Mr. Johnson: "Any more questions?"

Question: "Would not the slope depend upon the depth of the flow?"

Mr. Johnson: "Yes."

Question: "Would not the slope depend a great deal upon the growing season and also the intensity of the rainfall?"

Mr. Johnson: "I agree with you."

Comment: "We have actual records now of a year old gully where the dams were placed practically level. The log dam is thirty inches high on the average. The channel was silted in by May or June and assumed a 6% slope in one year. It was covered with Bermuda grass which is very resistant to erosion. There are 31 acres in that particular runoff."



Mr. Johnson: "If we are done with that I would like to raise one more question and one which on our project is of considerable importance, that of the design of diversion ditches. We don't know yet how to design them. I would like to get your reaction as to how you are building them. The thing I would like to know is what grade you can give these diversion ditches. Do we want to make them self-maintaining?"

Mr. Glass: "The first note I made down here was the suggestion of diversion ditches. As far as the design is concerned, we will use the same process in designing it as we will our terraces taking into consideration the average drainage area that we always have as a controlling factor. We use them for protection of cultivated land from rapidly eroding land that was in cultivation and is now discarded. Our plan for laying out these diversion ditches, of course, calls for providing a ditch of sufficient cross section capacity to handle the drainage from the restricted area. We use two schemes of laying these ditches out. One of them to be a continuous water course in which we may provide a grade of 6 or 8 inches between drops sometimes dropping the level of the channel as much as 18 inches to 2 ft. The other plan is put into use when we believe it advisable to follow as nearly as possible the field behind the line. The completed interception ditch then may appear as two or three individual water courses hooked together by a gradual surface drop that may reach as much as 8 or 10 feet difference in elevation. The best vegetation we have is wheat and it folded up and lost the middle of last June so that they did not harvest any crops. The most marvelous thing we saw in connection with fully control work are those matted areas of blue grass sod as a result of our efforts in installing vegetative coverages. Our native vegetative cover is buffalo grass and so



far as preventing gullies or carrying water it is practically nil.

It will afford immediate protection but if you want to do a good job  
of killing buffalo grass just give it plenty of water."

Mr. Johnson: "Any other question on this subject of diversion ditches  
in gully control?"



Mr. Ensminger: "Just a minute, the question was asked on costs.

I would like to give those cost figures now:

Wire check dams	\$1.09	man hour per linear foot.
Wire check dams with brush	1.05	" "
Sod Bag dams	.35	" "
Two box brush dams per cu. yd. of brush	13.88	
Rock dams per cu. yd. of rock	.30	

Comment: "This question of diversion ditches. We should make them just like a terrace. So many diversion ditches will become vegetative and I am just wondering if we want to hold strickly to the same recommendations for a terrace channel."

Mr. Johnson: "That is a good question. Postpone that question and bring it out in your paper. I feel that we do not know much about it. We can use some shrubs and some vines for vegetative growth of that type. I don't believe it could be used in the northern part of Illinois but I believe it could in the southern part. Mr. Ensminger mentioned the matter of gully prevention and reducing the runoff by the cooperator fencing particularly large gullies in terraced areas. If the farmer will do certain things and learn to maintain the work each year he can control his gullies to a very large extent. I think there is a good educational program for us to set them to realize that fact in connection with soil erosion control work. Mr. Chambers raised some very important questions. Who should have the responsibility of the planning and the installing of the work. Should that be placed under one branch head or should you attempt to carry on the work separately as engineers, foresters, agronomists, etc. How is it being done in the different areas. Mr. Ensminger, how are you doing it in the Illinois area?"

Mr. Ensminger: "Our gully control work in the Illinois area has



been under one head and the tree planting and seeding has been under the gully control department."

Mr. Johnson: "Tell about the way in which you have done the seeding of your gullies. You have relied on the farmers to do that seeding, haven't you?"

Mr. Ensminger: "In this work, it is laid out by the technician after he has completed the structural work. He takes care of whether it will be grass, legume seeding, or tree planting. He determines the type of seeding that will be used on that particular area. He goes to the agronomist or forester in each case. When it is time to plow the gullies the farmer furnishes the team and does all that plowing work with our help because in a great many cases it requires two men. He furnishes his own equipment and helps with the seeding program. We furnish the seed and fertilizer. I think that works out very well with that system. We planted 135 acres of trees in gullies and gullied areas."

Mr. Chambers: "We had better close this discussion. I hope that this matter can be discussed later on in the program."

Question: "I wonder if I am the only one that has not received copies of these papers that have been distributed. Are we going to get them eventually?"

Mr. Chambers: "Some of the papers were late in getting to Washington and will be mailed from Washington to us here. I think they will arrive before the meeting is adjourned."

Question: "How much of the discussion will we be able to get?"

Mr. Chambers: "These young ladies are taking notes on all we say and a mimeographed booklet will be mailed out to each project. It seems to



me that Mr. Johnson brought up a lot of important questions that are applicable to all regions. I am wondering if it would not save time to delay the discussions until all the papers on gully control have been presented."

Comment: "That is a very good idea."

Mr. Chambers: "We want to thank Mr. Johnson for his discussion. We want some very definite recommendations on the points that he raised. We know it is impossible to have a definite rule laid down for all projects but we can get some general rules that can be applied to all. In our work it would be impossible to lay out the same basis for work in Arizona where they have 15 inches of rain as we do in South Carolina where they have 60 inches. These recommendations have got to fit each project but will vary from project to project. We assume that all of you have that in mind for your particular area. You know your soil type, your climate, and with these conditions in mind, you can arrive at conclusions.

It is 12:30 and we are just two papers behind. We are going to adjourn for lunch and get back at 1:30 sharp. If there are no objections, we will meet promptly at 1:30 and continue with the meeting.

Meeting adjourned."



Tuesday P. M.

Mr. Chambers:

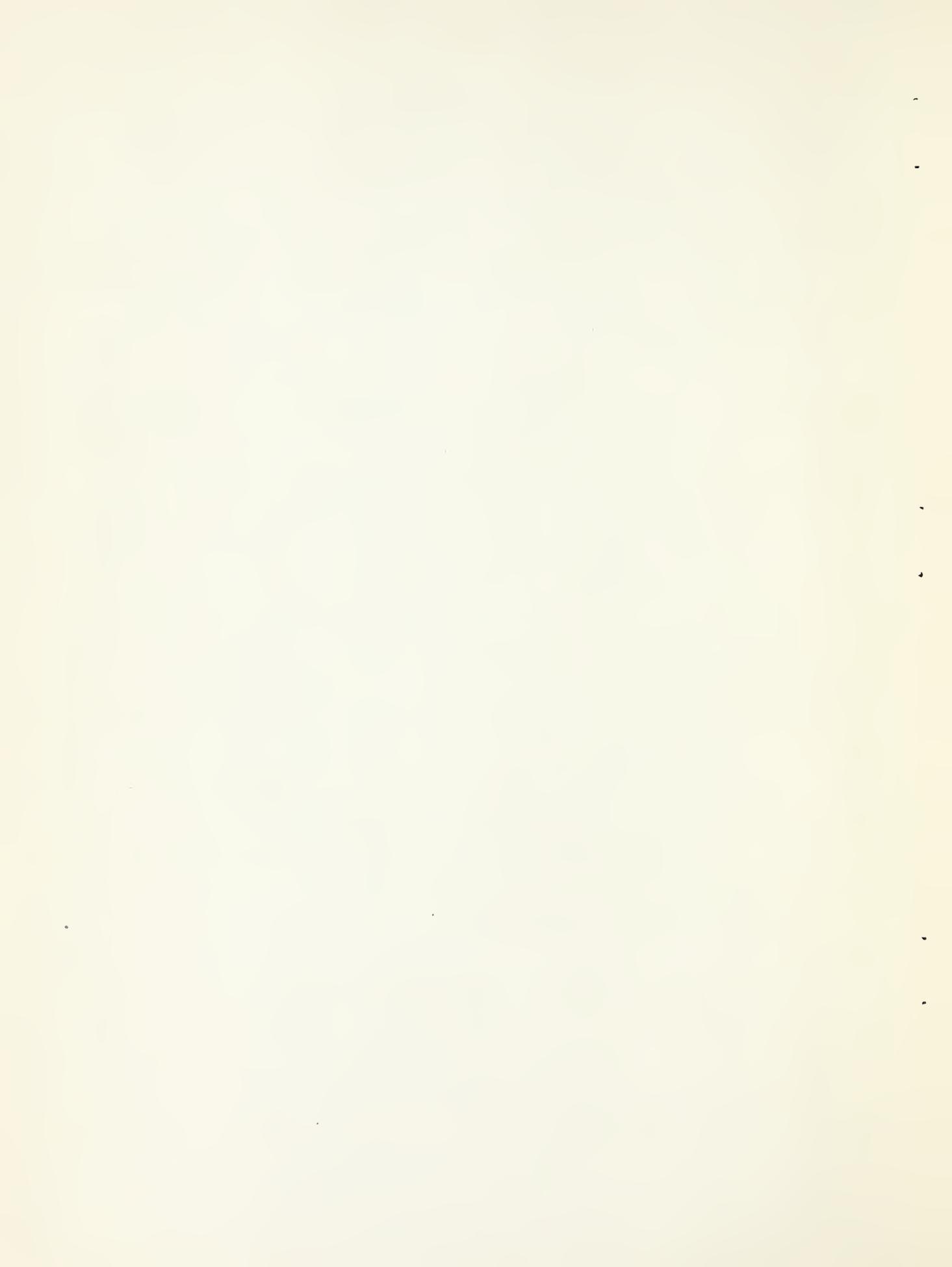
"Will the meeting come to order. We are passing around a little pad in which we wish you would please write your name, whether you are SRS or ECW, or some other Government or State agency, or from a Machinery Company, and the location of your headquarters or project. We need a complete list of those attending.

In getting up these papers we had two broad types of papers prepared, one which was designed to promote discussion and another type prepared from a more or less educational standpoint. I had thought to put the education papers in between the others in order to break the monotony, but to save time it seems that it would be better to take all the papers on gully control and then have the discussion. This will avoid having some of the things brought out over and over again. We will call on Mr. McAlister next for his paper and delay the discussion until after we have heard all the papers on gully control. We will delay the paper by Mr. Schuch, on photogrammetry until after the other papers have been discussed.

Mr. McAlister is from the Southern Piedmont, Spartanburg, S. C., and he has some gullies that are really gullies on his job. We will let him tell you about them, but they differ quite widely from Mr. Ensminger's who has large drainage areas and gentle slopes."

Mr. McAlister:

"Mr. Chambers and Engineers: Mr. Chambers has given you a little inside information on what we have to contend with. I have asked Mr. Chambers so many questions about what to do, he has thought about it a great deal and has it well in mind. When he sent out his memorandum, I read it over carefully



before I prepared the paper. There is one statement in this memorandum that my paper is built around, "Papers from various projects outlining conditions found in the major land and climate subdivisions of the United States will be presented." That is the basis of my paper. After I wrote it I thought it was more of a soils paper than engineering. I took it to our Chief Soils Expert and told him I had a paper on soils and asked him to look it over. It struck me that since gullies are in soils of some kind that we had better study the soil before we do too much, and that briefly is what we have done. We are doing a lot of gully work where we are trying to fit the soil to the other conditions. 40% of the land in this area has lost more than 80% of its top soil."

Mr. McAlister presents paper on "Gully Control in Southeast" and slides.



Mr. Chambers:

"Gentlemen: I am sure we appreciated Mr. McAlister's paper. He brought the pictures of those gullies so you would not doubt him. We will now jump from South Carolina to California where they also have severely gullied areas. Mr. Bamesburger has prepared a paper on "Gully Control in the Southwest" and we will now hear from him."

Mr. Bamesburger:

"The title of my paper on "Gully Control Measures of the Southwest" was designed for the three black sheep projects, Ventura, California; the Navajo, and the Gila River, but the problems are quite different. As my knowledge of the problems in these other projects is rather superficial, I have had to base this paper on my knowledge of my own project. We came prepared for quite a discussion. I have a few slides of some of the larger constructions but it is only a very minor part. Most of our work is in the smaller field gullies."

Mr. Bamesburger presents paper on "Gully Control Measures of the Southwest" and slides.

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Mr. Bamesburger:

"As I say, I have shown these slides which actually show extreme conditions which we have built out there and we would like to have a frank discussion of them. We have felt absolutely justified in building them but we do not feel that they would be adapted to other projects. We feel that we have an entirely different problem from the rest of you people but we are here to learn and will welcome any criticisms which you have to offer."

Mr. Chambers:

"We want to thank Mr. Bamesburger for his paper and his able presenta-



tives. I think these papers show you very plainly some of the varying conditions we have to deal with. We have over 30 different projects and the problems differ widely in almost every project.

I would like to ask Mr. Carpenter to open the discussion on Mr. McAlister's paper. When you stand up, please give your name and the project that you are from."

Mr. Carpenter:

"This discussion will be principally from the standpoint of we fellows in the East. McAlister brought out vegetative outlets and how long are we going to leave the spreader boards in these?"

Comment: "What is the objection to leaving them there?"

Comment: "Why spend money for creosoted lumber if we don't need it?"

Comment: "Wouldn't a 2 x 12 board that would stay two or three years be sufficient, or even a 1 x 12?"

Answer: "It probably will."

Comment: "I might say that over in the Illinois area we are getting white oak slabs ~~for~~ \$1.00 a load and we are using them without the creosote."

Question: "How close together should you have these spreader boards? Are you putting them in a vertical interval rather than a horizontal?"

Answer: "I expect about one foot vertical interval."

Comment: "We put them 20 foot horizontal, that is what we are putting in Wisconsin but we are only putting them on places about 12 to 15%."

Comment: "Where a big percentage of our land has a 6 to 12% fall, that takes a lot of money."

Question: "You think you are going to put in your outlet ditches without putting spreader boards on them?"

Answer: "We know we can't do it without it."



Mr. Carpenter: "Has anyone else any experiences on how far apart to put the spreader boards?"

Comment: "We started out putting the spreader boards before each terrace outlet. I had them put in 18 feet horizontal."

Comment: "We have been putting some on the Texas project without the spreader boards and we have had good results."

Comment: "We are putting a four foot strip or 8 foot center in the final board."

Mr. Carpenter: "Are you fellows shaping your ditches by hand?"

Comment: "No. 2 terracers."

Question: "How do you build your outlet ditches, with a trail builder or by hand?"

Comment: "We use trailbuilders."

Comment: "In Alabama we can't get our terraces built, much less use them to build outlets."

Comment: "It is costlier."

Comment: "How do you get these trailbuilders?"

Answer: "Request them."

Comment: "We got 3000 acres of terrace lines run in order to get strip cropping last fall that we are not going to get to use."

Comment: "We use the rotary fresno."

Question: "Has anybody had any trouble with washes starting from flanges on the terracer wheel?"

Question: "Is that due to soft earth?"

Comment: "We are going to take some of those off and put some terracer rims on



them."

Comment: "Can you terrace under those conditions?"

Question: "How many of you have tried putting extension rims on your terracers to hold them up from washing on this soft ground? Has anybody else had any trouble using these machines in soft ground?"

Comment: "We put extension rims on one of our terracers and they worked so nicely that we are using them almost altogether."

Question: "Are you building these or are they factory made?"

Answer: "They don't have them at the factory but they said they would build them for us there."

Comment: "We just lift the flange on that particular machine and put the extension rims on the inside of the wheel."

Mr. Carpenter: "I am going to start something. I understand that a number of you are building flumes for your terrace outlets. Is that a paying proposition?"

Comment: "When you turn it loose on a highway ditch, the highway turns it back on some one else."

Question: "Where are you fellows emptying your terraces or are you bringing them back to the natural outlet?"

Comment: "If we have got as much as a terrace handling an acre we don't figure on an outlet."

Question: "Shouldn't these terrace outlets be emptied into natural outlets?"

Comment: "We are having to treat these ditches. Most of the gullies under way are property line ditches."

Comment: "Ever hear of anybody getting shot?"



Comment: "We are running them from one mans farm to the next mans farm."

Question: "How are you going to keep it maintained when he stops plowing?"

Answer: "He agrees to let the other fellow come over on his land and maintain that terrace. He does not agree to maintain it himself."

Comment: "That is mighty nice if they will do it."

Comment: "All you have to do is get out and sell the idea."

Question: "What do you do in a change of ownership?"

Answer: "One man had an agreement written up between the landowner and the Service and recorded it in the county records there."

Comment: "Looks to me that it would be the only way because you should figure it as a lifetime proposition."

Comment: "This emptying into roadside ditches is alright except that when you get everything all fixed up nice and get a road maintenance crew all lined up, the administration changes and along comes a new crew and they immediately drag the ditch and there goes your outlets."

Question: "How long do you run your terraces? What's the maximum length?"

Answer: "We run them as long as necessary. 2000 or 3000 feet."

Comment: "That's in Mississippi. How about Oklahoma?"

Comment: "40 miles from here is a terrace a mile long that is holding."

Question: "Mac, on some of those little gorges what kind of protection do you use at the head of them?"

Answer: "Protection of the head of those dams went right on back up to the head. No overfall at all. We try to make the water walk down instead of running down."

Question: "Mac, did you dynamite those gullies in?"



Answer: "We used trailbuilders mostly."

Question: "Do you have the cost in square yards of cubic yards?"

Answer: "We have it in cubic yards. 2.3¢ with trailbuilders and 12¢ with dynamite."

Question: "Do you attempt to divert any of the water in those large gullies?"

Answer: "If we can divert the water we do but if we can't we put in these wire dams."

Question: "What is the maximum acreage of water you can handle with those wire dams?"

Answer: "27 acres with Bermuda."

Question: "Do you have any figures on dynamite and trailbuilders?"

Answer: "The dynamite is a great deal more expensive. 30 to 40% higher."

Mr. Carpenter: "This business of these gullies, what is the opinion of the meeting on building an outlet ditch along the side of the gullies and filling across the gullies with earth fills? Why wouldn't it be less expensive to build a terrace outlet by making fills across that gully even though it is 15 or 16 feet deep?"

Answer: "On those big gullies, it would cost too much money."

Comment: "Our soil conditions would not permit us to do that."

Comment: "You mean build it across your gully. As long as it is in the B you can do that."

Carpenter: "Fellows, this is no lie, this is a fact. I can show you less than 100 miles from here a gully 49.7 feet deep and something over 200 feet wide at that point and 3/4 of a mile long, one ten day rain in 1932 ruined something over 600 acres of land down below. That is less than 100 miles from where



you are sitting now.

Is there anything else? How about using a temporary measure to handle the water through that gully?"

Answer: "That is all right if you can use a temporary measure that will last long enough to get the vegetation started, it is safe. We have got to go mighty careful about the use of these structures. If you get the vegetative control and you cannot hold it by vegetation, what have you gained?"

Comment: "I wonder if some tree growth wouldn't hold it better?"

Question: "I am wondering if it is possible to provide an apron that will give you the flume effect after the structure is gone."

Answer: "Sometimes."

Comment: "I think it is possible to have your brush so placed that it should fill up or you could probably fill in with earth and sod."

Comment: "We don't know how much overfall we can take care of with vegetation."

Comment: "I am just wondering if we are not counting too much on trees. It has been my experience that if we have trees we won't have grass and if we have trees without the grass the top soil is exposed and overfall will wash the soil out from between the roots. If grass won't hold this overfall we can't expect much of trees. As far as trees are concerned, I can't see them for that purpose. They will bind large quantities but not as closely as sod will."

Comment: "Every area has its individual problems."

Chambers: "I wonder if I might add an observation along that line. One is the height of dams and the second is the shape and grade of these outlets channels that we are cutting to drain terraces. It might interest you to



know that the Soil Erosion Service is preparing a small handbook in which the height is discussed - 18 inches for wire dams, 30 inches any type of brush dam, and 36 inches for any other temporary type of dam including rock, loose rock, log dams, planks, or what have you. It is possible that those may be too high. There is a question as to whether there should be any dam there at all or not. I have personal opinions that we place dams in gullies under two general conditions: 1. Gullies in large drainage areas where it is doubtful that vegetation would control erosion; 2. Where you place temporary dams on graded intervals so that one would fill up to the next and hold the movement of earth rather than to catch a little top soil or silt. The other point about the preparation of the channel. If we know what critical velocity certain soil types under different conditions of vegetation would stand this thing of designing channels is a very simple matter but we are working in the dark. Will sandy land under Bermuda grass stand 2, 3, or 5 foot velocity without eroding? We would like to know whether or not the Soil Erosion Service should establish a few experiments that would put this thing on a more or less cut and dried basis.

I wonder now if Mr. Mathews would not enter into this discussion. He has some conditions out there that we do not have in the Southeast."

Mr. Mathews:

"We have a lot of conditions in the Navajo project which many of you do not. It is hardly one question in the Navajo project of 17,000,000 acres of watershed and for that reason we have our project divided up into zones and we have to take more than actual erosion into consideration. These areas will run from 8 to 67 square miles. We treat our upper zones on a slope varying from flat up to  $1\frac{1}{2}\%$  with more of a spreading water than we are with actual gully control. We have gullies 100 to 150 feet deep.



We do not plan to do hand erosion control work due to geological and climatic influences. We are not concerned with the farming in that area. Our problem is to protect them from further cutting of the valley floor. We are not concerned with what you call temporary structures, etc. Our problem is to bring back conditions to where they were before we had sheet erosion. We have plenty of country to work with. Our idea is to hold that water in order not only to prevent flood peaks but to aid in the re-vegetation of that land. On the slopes from  $1\frac{1}{2}$  to 6% we provide weepers and spreaders to take the water and spread it. In this case we cannot afford to attend to detail like most of you do, we use either the low rock type dikes or we will perhaps use a sack filled with soil. We are having a great deal of success with this at the present time. We have an average of 9 or 10 inches annual rainfall which varies from 3 to 4 inches up to 15. 40% of the rainfall occurs during the months of July, August, and September. Our steep slopes we just forget, except in some cases where we have the active cutting of gullies and we take care of that by putting out check dams 3 or 4 feet in the ground. In some cases we do have to allow for a certain amount of silting beds on which we can do our revegetation work. In many cases on our diversions we have to drop the water in a 6 to 7% slope. We do most of our work in what we term as our valley floor, slopes 2 or 3% down to the flat. Here we are met with the problem of head erosion. Our main work in this case is two types. If we have an area flat enough we try spreading a whole floor of water, in other cases we divert through a ditch part of the water. I do not want to take up any more of your time as I do not feel that these problems concern any of the rest of the country. I am a little bit doubtful whether control of a gully can be defined in terms that a checkdam should be a certain height due to the quality of water



or soil, but I should say that it is the purpose you are going to use those controls for that should be taken into consideration. If you want to divide the water by spreading it or if you are going to silt up that gully then it seems to me you can use a temporary structure. The main object is silting up the gully but in the case where you are building structures just to control active cutting I do believe you have to go pretty slow in hoping the revegetation will hold them after the giving away of the material after construction. I have no more to add until later on in my paper where I will deal with more phases of the work of the Navajo project."

Mr. Stokes:

"In the height of dams, the point that I was endeavoring to make was that not any given type of soil would guide us or prove in advance whether we should build three foot dams, for instance, so that it would hold at least until the revegetation can take hold. You might find that 3 foot height of dam might be the right economical height in one soil while in another it would not be. The hydrological problems involved might still leave the same resulted economic height. One thing we are putting a great deal of emphasis on is aprons. Even with a little check, we rarely put in anything without an apron. One of our main difficulties is preventing secondary cutting below the dam. We are putting in this second minor structure to form a pool of dead water. There is quite a nice little problem between the height of the dam and the extent of the water. There has been some work done on the length of aprons to the height of the dam. Mac and Johnson have done some work along that line."

Mr. Chambers:

"Thank you. There has been some work done on the length of apron and the height of dams. It seems that our old rule of building the apron  $1\frac{1}{2}$  times the height of the dam is safe for low structures. I am sure that in building



permanent type structures where a large investment is involved there is more work to be done on that question."

Mr. McAlister:

"I would like to say in that connection that I have a few pictures of the results we got in the hydrological laboratory that I did not show this afternoon. If any of you would care to see them, I will be glad to go over these with you tonight after supper. Prof. Johnson, who had incidently done some erosion work found there was a different relation between the length of apron and the height of dam which only applies to about a 3 foot dam. Prof. Johnson found that by placing a baffle in crossed terrace outlet, we use a 2 x 4 placed flat, if this baffle was placed in the floor of that apron he could reduce turbulence at the base of the dam. It does away in our small structures with the necessity of building such large height to the apron and we found that it is better to have a vertical side instead of a sloping side. We have some blueprints and diagrams worked out by Prof. Johnson. If any of you want to see them, we will be back in this room tonight."

Question: "Were those experiments made with clear water or muddy water?"

Mr. McAlister: "They were made at an old water works at Spartanburg. The stream had been deserted and it was decidedly muddy. It was not clear by any means. We noticed a great difference between light silt and heavy silt."

Mr. Jepson:

"In the West Virginia project we have our gullies spread all over the place. They are very much concentrated. Not very much has been said about protection of the gullies after the structures are in. If that is not handled properly the vegetation will not do much good. It is impossible



to erect a fence around every one of these gullies. That is just the point I want to bring out."

#### I N T E R M I S S I O N

Mr. Chambers:

"Gentlemen: We would now like to have the paper on "Relation of E.C.W. to S.E.S." This paper was prepared by Mr. J. G. Lindley. As Mr. Lindley was unable to attend the meeting, Mr. Thompson will present the paper."

Mr. Thompson presents paper on "Relation of E.C.W. to S.E.S."

Mr. Thompson:

"It was intended that a few slides should be shown. They are to be shown to illustrate technical work being done in the different projects. A number of them have already been shown. I believe I will slip those of the pictures that have been shown and show those from the projects which have been not shown. In showing the pictures, I am just going to read such captions that will give you an idea of what the picture means. Any questions you would like to ask about these pictures if directed to me, I will refer them back to the projects."

Pictures presented.

Mr. Chambers:

"I wonder if any of you gentlemen from the E.C.W. camps have some discussion to bring out in this meeting. Anything in the way of E.C.W. problems should be brought out."

We have five camps in one area where they have put them to doing a class of work that none of the other camps have used C.C.C. labor for.

Mr. Bennett will you tell us about the work of the C.C.C. camps in



Arizona?"

Mr. Bennett:

"Our work does not differ from the other C.C.C. camps except that we are interested in water reservoirs to a large extent. Our problems are a great deal different than those of most of you gentlemen. We are in an arid and semi-arid country where water is one of the most important things to the stockman. A large percent of the area in which we are working is public domain. We are trying to develop reservoirs of large enough capacity to provide sufficient water in the dry seasons and encouragement for grazing in the areas where we find particularly good grazing but because of the absence of water has not been grazed. We have built some stock reservoirs on private lands and other lands in our cooperative agreements with the owners. We have done some channel work and provided irrigating ditches which are entirely on private land and are using C.C.C. labor. While this work is not done for a large community as a whole, we have really benefited a large community by doing this. We have protected highway bridges, flumes and syphons on the rivers which have all been on private land and one who is not familiar with it might think that it is a private enterprise. Syphons and concrete structures have been put in by a ditch company organized by the people on the river who are using the water for irrigation purposes to protect their ditches from overflowing channels and if those syphons were cut out it would mean that several thousands of dollars would have to be raised by individual people to put them back. Right now I cannot think of all of the undertakings, we have so many of them. We have five camps over an area of a good many miles. Some of our work is being carried on at a great distance from the camps. It has made our work very costly. We have a very friendly spirit on the part of all the stockmen towards our program. We are con-



stantly trying to build that up. Unless we are too severe in our grazing restrictions, on those lands, we will get all of their cooperation."

Mr. Chambers:

"Anyone else have anything to offer on E.C.W. problems? How about Missouri? They have a large number of camps. Does anyone from there wish to say something? From Georgia? Mr. Hart? Mr. Carreker?"

Mr. Carreker:

"One thing I want to say. Can we get some correlation or standardization of the records that have to go in on that E.C.W. 7? We have to keep them and would like to know how to keep them. I have had the pleasure and privilege of being a camp superintendent and have the responsibility of the Form No. 7. For instance we are planting quite a large area of Kudzu - some of it on gullies, some of it on big slopes and some of it on slopes that could be planted to something else. How do you report that? So far as I know, no satisfactory answer has been given. Another thing, how do you deal with the Army? Maybe that is not supposed to be brought up in this meeting but the Army has been talking seriously about decreasing the amount of time the men work in the field. I do not know whether they will have the power to do this or not but if they do, it will lessen our program a whole lot. I am in favor of educating those boys if we can but I think we should get some work out of them as well as educating them. We have some good boys working for us, most of them put out to the limit of their ability but if they are told by the Army officers who come down there that they are here for more of an educational program than to do some work, we will not be able to get any work out of them. It is serious with us."

Mr. Thompson:

"There has been a complete revision of those forms and I think you will



have very little trouble in putting it to work."

Question: "When does it go into effect?"

Answer: "It is ready for publication now. It will probably be around to you in a few weeks, about the 1st of March."

Question: "How will we make the correlations on these? Can we carry over from our old forms?"

Answer: "It will be up to the office in Washington to make the correlations. You won't have to do it. You just start in and find a place to put your work. If you have been reporting on 1 and 2, you won't have any trouble. I think they have revised it to include just the items we have now."

Mr. Chambers:

"We would like to hear from Mr. Hart of Georgia."

Mr. Hart:

"We have been getting along very well. We have had no open outbreaks and have had the closest cooperation in the world. I have been working with the C.C.C. two years and in every case I have been able to get along with the Army very well. I did not know the Army was starting something new about the educational program, Mr. Carreker. It is news to me and has not broken out with us yet. I expect I am the oldest Agricultural Engineer here. I started in 1908 along with Jim Davidson and Chase. I was with the University of Chicago for 12 years. The correlation of the E.C.W. and S.E.S. work is a big problem. At first the relation of E.C.W. to S.E.S. was totally misunderstood although I see no reason for misunderstanding. The handbook stated very clearly where these two organizations should be clearly correlated. I cannot see why there should be misunderstanding but I can see where there is a great deal to be done in a closer understanding. One of our biggest problems is to the amount of work that C.C.C. boys should do. They



do six full hours of work on the project. It is the man's responsibility in charge of these camps to recognize future citizens in the boys in it and build on that basis. Their character and their outlook on life are under your supervision and a lot depends on how you handle it. In giving a days work for a day pay a man couldn't be in a C.C.C. and shirk his work and keep himself honest. He couldn't do it. This proposition of not being on time and of shirking your responsibility is a form of dishonesty which should not be encouraged. It must be born on those men's minds that honesty in getting a days pay is dependent on them. I do not know what Mr. Chambers wanted me to talk about but when I get wound up I don't know when to stop. We unfortunately had a fatal accident the other day. A truck containing a number of men was crowded over on seeing a little girl pushing a wagon with a baby in it. The driver swerved the truck and went up an embankment but the baby was thrown from the wagon and hit the side of the truck and was killed. By the driver's quick action he avoided killing several. It was not two hours after that happened a delegation of boys brought \$62.50 to me to help defray the expenses of that funeral. When you have men with that much of the milk-of-human kindness in them, you have possibilities that are incomparable. Those things are going to stamp the man and future citizen that we have to depend on. They are fine upstanding boys. I was very much surprised when a young man whom I know came down and went to a C.C.C. dance and I asked him what the difference was between this dance and the University dances. He said there certainly is a difference, these camp men were sober. I dealt with University men for 12 years and the C.C.C. boys for two and I tell you frankly there are possibilities there."

Mr. Chambers:

"Does anyone else have anything to offer on the C.C.C. camps? If not,



we will adjourn. Before we go, I would like to make an announcement. I wonder if there would be any objection to our meeting here tonight. There are two papers left to be read on today's program. One of these papers is by Mr. Schuch on photogrammetry. Mr. Schuch's paper will be instructions on how to use air-photo maps. We are spending a great deal of money having these aerial surveys made and some of the areas are not using them to the best advantage. The other paper is by Mr. Krimgold on hydrological data. These papers are both short and we won't be here over an hour. If you will get here at 7:00, we will start then."

Question: "Why not just go on now until we are through with today's program?"

Mr. Chambers:

"All right. If there is no objection, we will have the two papers read now. We will hear from Mr. Krimgold."

Mr. Krimgold:

"A couple of months ago I could have introduced myself as from the Navajo project. I am no longer connected with the Navajo Project but I am now placed in charge of hydrological data in Washington to see that we collect all the information we can on the rate of rainfall, average silt content of our streams and the like. The purpose of my paper is to impress upon you people as much as I can the importance and necessity of collecting hydrological data."

Mr. Krimgold presents paper on "The Collection of Rainfall and other Hydrological Data on the Soil Erosion Service Project".

Mr. Chambers:

"Anyone wanting to ask any questions?"

Question: (Johnson from Washington State) "What are the methods used on snow surveys?"

Mr. Krimgold:



"Hardly any other of our projects have that problem. We are going to put out a circular or bulletin that will show you already established practices in snow surveys. There have been some developments, of course, for establishing depth and density of snow before spring by which they are able to forecast the water runoff that will come from the snow. I did not prepare to give out instructions now but we are considering that problem remembering that Washington State is one of our problems as well as probably some of the higher places of the Navajo Project. There is snow on some of our other projects but there it is just a matter of catching the snow. However, on high elevations, the question is different from the lower elevations. Snow surveys must be made. Any questions that are bothering you, we will take them up and I hope fully to answer them."

Mr. Chambers:

"Any other questions on hydrology?"

Question: "What are the proper methods in taking silt samples along the streams?"

Mr. Krimgold:

"Now you asked something. Silt sampling is a very complex problem. There are several different devices used. The U. S. Geological Survey is using the milk bottle in testing the silt. There are various methods. The U. S. Department of Agriculture has devised a sampler consisting of an aluminum tube with two rubber sleeves."

Question: "We have just installed a device and we are wondering how to get the samples."

Mr. Krimgold:

"The watershed laboratories in Vicksburg are trying to devise new methods. We will have to investigate those and try them out and get the results from



other agencies and adopt the best one used. The U. S. Geological Survey is conducting measurements on 8 of our areas. The arrangement was made back in 1933 at the beginning of the Soil Erosion Service and by that arrangement they were to carry out the work as they see fit. They adopted more or less U. S. Geological Survey procedure and they have employed their own instruments, some of which to my estimation are not as good as other devices already used but we will have to let the U. S. Geological Survey proceed as they do in those areas where they are working because this is the basis of the agreement. So far as gauging on our own projects is concerned we will try to inaugurate the best system we can find. One that I am in favor of would be that tube."

Question: "Will the United States Geological Survey allctment run out at the termination of the present emergency work? Will they continue to do that work or will the Soil Erosion Service take it over?"

Mr. Krimgold:

"You are asking the little fellow too big a question."

Mr. Chambers:

"We will ask Mr. Schuch to present his paper on Photogrammetry."

Mr. Schuch presents paper on "Practical Photogrammetry".

Mr. Chambers:

"Mr. Schuch has more pictures. If any of you are interested in seeing them. Are there any questions on the practical use of the photos on your project? If there are no questions, we will stand adjourned until 9:00 in the morning when we will start the discussion on terraces."



Wednesday A.M. 9 o'clock - Meeting called to order.

Mr. Chambers:

"Gentlemen: The program today is largely on terracing which will be following by discussions. We had gully control work on our program yesterday and terracing work today. In addition to the terracing papers, one or two other papers will be read. One is on "Hydraulics of Design of Channels" by Mr. Cook. Mr. Cook has a lot of good ideas and there is a lot of good information in his paper. We will have one of the terracing papers and sandwich one of these in between to have a change occasionally. First, we will hear from Mr. Glass. Mr. Glass's paper will be on "Construction of Terraces with Elevating Graders". Mr. Glass has done a great deal of work on the Kansas project and has had a lot of experience in the building of terraces with elevating graders. No other project is using these elevating graders except Nebraska. Mr. Glass."

Mr. Glass:

"Mr. Chambers, Fellow Agriculture Engineers: I know that when I make that statement and call you all Agricultural Engineers it does not exactly fit a good many of you because when the Soil Erosion Service was organized, if your projects were developed as ours was, you had engineers of pretty nearly every kind. We have every variety of engineer that has ever existed on the face of the earth now engaged in erosion control work. We have electrical engineers, mechanical engineers, civil engineers and agricultural engineers by training on our projects. I do believe, however, that every man engaged on the job that we are engaged in today through his activities since the time he has acted as an engineer in Agriculture has by his own hook become an agricultural engineer.



The American Society of Agricultural Engineers has been responsible for so many effective efforts on the part of engineers to apply engineering principles to agriculture that we cannot enumerate them. I want to give credit to the organization for the way in which it has handled itself and handled the men. Just as we have on our job of erosion control all types of engineers, the American Society of Agricultural Engineers is made up of this same kind of group. We have all kinds of trained engineers, and we have men who have had very little academic work but who are engaged in engineering practices and who are recognized today as some of the outstanding engineers. I am firmly of the opinion and I hope you will agree, that none of us can get along in a very satisfactory manner without affiliating himself with an organization in the job in which he is engaged. I want to extend to everyone the invitation to get acquainted with the American Society of Agricultural Engineers and become affiliated with that organization. They can be and are anxious to be particularly of assistance on this job of erosion control. When I said fellow agricultural engineers, probably there are a lot of us who are not agricultural engineers in the true sense of the word but a very large percentage of us can answer in our own minds that we are agricultural engineers.

If I may beg your pardon, Mr. Chambers, after listening through the session all day yesterday, I wrote a page of preface to this paper on the subject assigned to me and although it may be a little out of the ordinary I hope it will not detract from the paper as I have prepared it and I believe if you will follow it closely some of you see some hooking up



between the ideas in this preface and the equipment that we are using on our project. In the first place I rather crave to be different from other folks. I like to try to think of things from anglos different than those that have been presented by others with whom I come in contact. We learn but little by following precedence. We may improve on this precedence. We devise things of our own and the means of accomplishing those plans. We have a job that has been turned over to us that is more important from a national view point than any other single activity at the present time in either national, state, local or other independent projects. The stability of our very existence depends definitely on just how we are meeting the situation. The very idea that simply because a man has title to have and to hold a little land for the short span of a lifetime certainly should not permit him either to enrich or destroy as he sees fit to the encumbrance of those who follow him on the land. It is wrong in principle and cannot be supported by economic results. Erosion control is not and should be recognized that it is not an individual land owners problem. It is a national problem of more importance to the large majority of people than the restrictions of our foreign markets, more important than the gold content of the dollar, more important than the establishment of inland waterways and more important than the conservation of other products of our land that are now closely guarded by national supervision. I am trying to look at the problem of erosion control from a point at considerable distance in the future. I do not believe that simply because it has been the natural processes of development to begin in a very small way that it is necessary for us to do that in Soil Erosion Service. We have the opportunity of grasping the



situation in our organization as no one has had the opportunity in the past. For example, in the past farmers built their own roads. Those of you who have been born and reared on the farm remember working out the poll tax, and we never had good roads. The township came next in the organization. They consisted of farmers without experience and without knowledge in building a road system. We still had no roads. The state organized the state highway commission and then the Federal Government came in and began building highways across the country. Is it necessary that Soil Erosion Service pass through the same growing pains period? I don't believe that it is. You fellows right here in this room have the opportunity of grasping the situation as it has been deliberately laid in your lap and doing something with it and maybe by the time you have passed on and the other fellows come after you we will not be about where the township came into the road building program. I believe Mr. Kinnear has a few viewpoints in this connection and I am going to ask him to express them to you."

Mr. Kinnear:

"It seems to me that the situation has been shown in Nebraska and other areas that this erosion control program is a great deal like a snow ball. I think it is up to us to keep a jump ahead of it. The F.E.R.A. individual E.C.W. camps, private individuals, counties, townships, etc. are all very much interested in soil erosion control work and they are working in individual units to forward its development. We have worked out a cooperative program with the State of Nebraska with the counties and townships with the idea of being able to supervise and help out with this large program. I want to point out that the opportunity is at hand and it is growing and



expanding. It is important that we keep abreast of the time and realize that it is a big job and is going ahead very fast."

Mr. Glass:

"On this subject as it is printed on the program "Construction of Terraces with Elevating Graders" I felt that it should be reworded due to the fact that we do not build the complete terrace with the elevating graders alone. In order to give you an idea as to the conditions under which we are using this equipment, I have made an effort to paint a word picture of the project as well as I am able to do so."

Mr. Glass presents paper on "Terrace Construction with large Equipment Units" and slides.

Mr. Chambers:

"We wish to thank Mr. Glass. I am sure we received a lot of information in developing new methods of meeting old problems. It would not fit on a lot of our projects but it does work out on two or three projects. Nebraska is doing a similar type of work. Our next paper will be "Hydraulics of Designs of Channels". We will digress from the regular program and break the monotony in order not to have too much of the same subject matter. Mr. Cook, Hydraulic Engineer of the Soil Erosion Service, has prepared a paper on designing terrace outlet ditches. I think all of you have a copy of this paper. We will now call on Mr. Cook."

Mr. Cook:

"The material which I have is not a narrative paper. It consists of diagrams that will be included in a handbook that Mr. Chambers is putting out. I have not prepared any form of paper on this subject. I will touch the points which I think may be of interest to you people. It is



obvious that hydraulic design is very important in our work. The design of check dams, spillways, and culverts are all being treated in the handbook but here I will only deal with channels."

Mr. Cook presents paper "Diagrams for use in Hydraulic Design of Erosion Control Structures" with illustrated diagrams.

Question: "I am wondering about the permissible velocity."

Mr. Cook:

"The permissible velocity from a hydraulic engineering standpoint would be purely academic so far as we are concerned. We are dealing with cases where the maximum velocity exists but a short time. That is something we will have to find out in the field. I assume 3 feet per second for nearly all soils would be permissible. Perhaps if you have a good growth of bluegrass sod and your floods last only about a half-hour, 5 feet per second would not damage the channel any."

Question: "Do you mean to recommend that 3 feet per second would be satisfactory for all soils?"

Mr. Cook:

"No, that is for the ordinary loam soil. Texas soils should stand more than that."

Question: "Are you making that recommendation or are you working on that assumption?"

Mr. Cook: "You people will have to find out about that yourself."

Question: "I would like to know of any inexpensive apparatus to install to measure the velocity."

Mr. Cook: "You might take the discharges with a current meter."

Mr. Chambers:

"Can they investigate the approximate velocity from these formulae?"



Mr. Cook: "Yes, they can, but Mr. McAlister wants actual measurements."

Mr. McAlister: "We want the depth of flow in the channel. Some automatic depth machine."

Mr. Stokes:

"Why do you consider these proposed set of curves are superior to the standard reclamation handbook?"

Mr. Cook:

"I am aware that this handbook exists. It is a very good one, however, this formula is supplanting the Cutter formula because it is so much easier to use. I have no objections to any one using the Kutter formula. It is just as good."

Question: "Why bring out two standards by two Government agencies?"

Mr. Krimgold:

"Being from California, I naturally favored the Kutter although I knew of the existence of the Manning. When Mr. Cook showed me the new set of curves my first reaction was just that; why make a new set when we already have all that worked out in the Reclamation handbook. I was not very enthusiastic at first, however, I am going to uphold him now. If our Soil Erosion Service handbook is to be used by people who are not hydraulic engineers, we must make it as simple as possible. We have to make it so that the fellows who have to use these tables and designs will not be faced with a lot of figures and have to spend a lot of time in figuring out how to use them and come to the conclusion that they might as well make it 3 feet wide and two feet deep and not spend time designing them. If a fellow has a set of curves which are quick and easy the steps are fewer and confusion is reduced. It is much better to have a set of curves of different type than the standard, than to have one who has not used the reclamation handbook try to use it. I



am convinced that Mr. Cook's handbook is much superior. This Service being new in dealing in hydraulics it might as well make the step in improving hydraulic methods."

Mr. Cook:

"I really think we should not make the channels too wide. There will be cutting in the bottom of the channel."

Comment: "I agree with you there but in many cases I think we could make them narrower, especially in diversion ditches."

Mr. Cook:

"B/L = 10 is just suggested as a figure that ordinarily should not be exceeded. You could make it smaller."

Comment: "I beg your pardon, I thought you said not to vary from it either way."

Mr. Cook:

"I think the most important thing to impress on you is that the velocity in the channel should be investigated. You should know what the velocity will be in any channel before it is constructed."

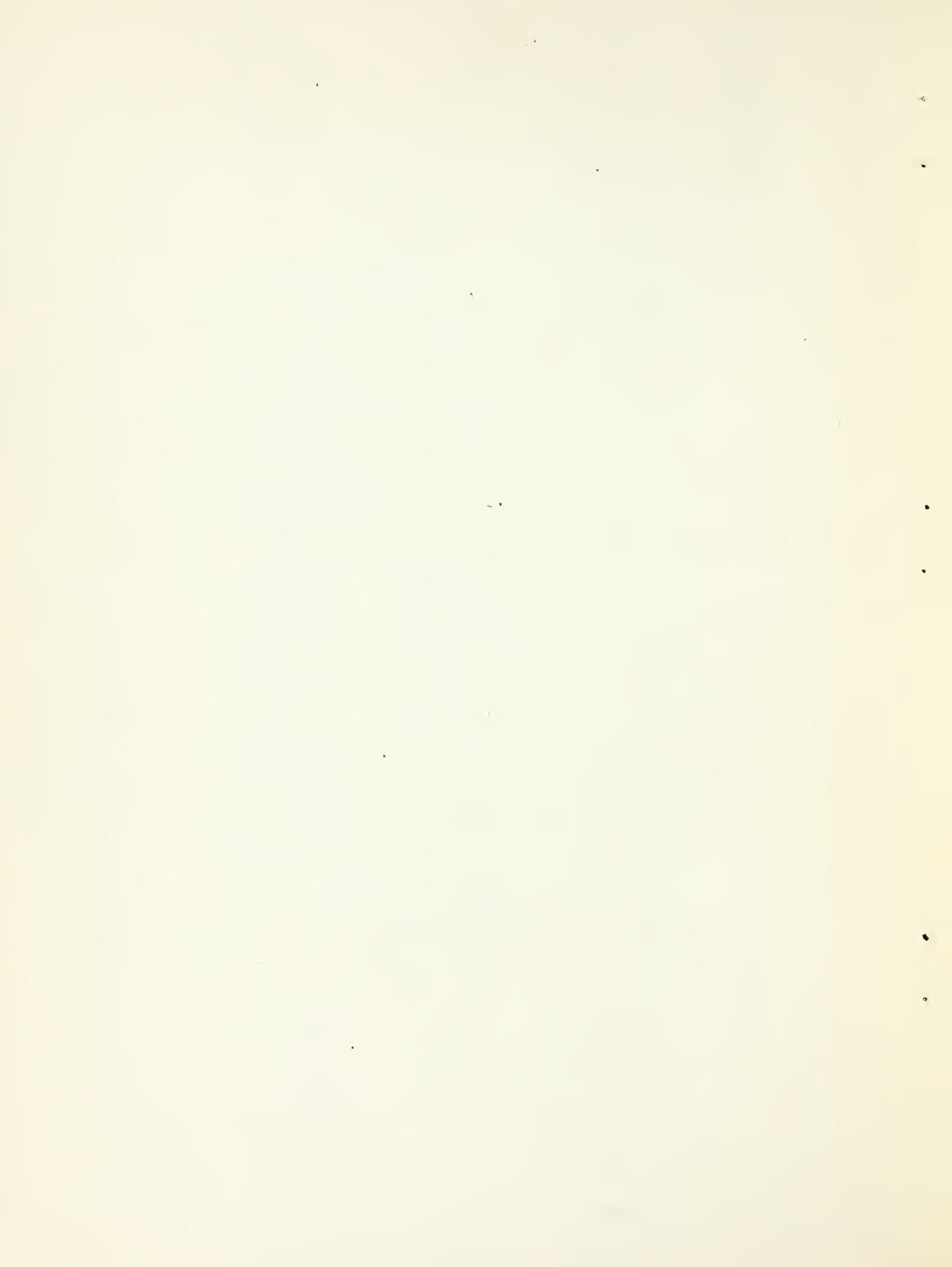
Comment: "Until we get some more accurate data than I know anything about, I do not know how to deal with this velocity business."

Mr. Cook:

"It is unfortunate that we don't have very much data. The best data that are available are from the erosion experiment stations. I am quite sure that Mr. Ranser considered all of those things in setting up his curves. Mr. Ranser's curves are very conservative."

Mr. Chambers:

"Thank you, Mr. Cook. This is a highly controversial subject. It would be a good idea to go back to your channels that are failing and investigate by these formulae the velocity you are getting and it may open



your eyes as to what is going on. It may show you that you have more velocity than you thought you had and give you some idea as to how to figure for your future channels. I believe if I may add another statement about the Reclamation handbook, it was probably designed for channels on which the grade could be controlled. In channels in which the grade is determined by the slope of the land, we have to control the velocity by spreading the channel or establishing checks."

"It is getting late now. We will go on with our schedule of papers. We will have Mr. Ryerson's paper. Mr. Ryerson has some very different conditions on which to build terraces. Mr. Ryerson."

Mr. Ryerson:

"Quite a few of you have visited our project up in Wisconsin and all who have are jealous of the abundance of the bluegrass that we have. If you look a little further, I am sure you will see other conditions that you probably won't be so jealous of. It has been our idea up there that since this is a soil erosion demonstration project and since also very little erosion control work has been done in that particular section of the country, we should be especially careful not to make mistakes. We are trying to bend backwards in order to end up by standing upright. Sometimes we have missed and we are changing our ideas constantly. We will continue to do so. I will probably bring out many points that you will disagree with and if you do I will let you."

Mr. Ryerson presents paper on "Terracing Problems in the North Central States".

Mr. Chambers:

"We wish to thank Mr. Ryerson. He brought out a number of questions that, it seems to me, the committee would do well to consider, particularly the equipment used for constructing terrace fills, methods of constructing



terraces and various other points that I don't believe were brought out in other papers. We will have to get to the next terrace paper and that will conclude the papers for this morning after which we will adjourn for luncheon. We will now hear from farther south where they have been terracing for several generations. Mr. Raney has been delayed in getting here but finally arrived this morning so we will hear from Mr. Raney."

Mr. Raney:

"I might say the longer I waited, the longer I had to collect material to read so we might be here a long while. My title is, "Terracing in the South"."

Mr. Raney presents paper on "Terracing in the South".

Mr. Chambers:

"We wish to thank Mr. Raney very much for his paper. The first paper after lunch is by Mr. Ramser. He has come all the way from Washington, D. C. to deliver this paper and we are very grateful to him for it. We will have to get started strictly on time. Come back as near to two o'clock as possible. These papers have taken longer than we thought; we are still two papers behind but we will not continue as late today as we did yesterday. If you have no objections, we will now adjourn."

Adjourned for luncheon 12:30 PM

Wednesday afternoon. Meeting called to order at two o'clock.

Mr. Chambers:

"One announcement - Mr. Turner of the International Harvester Company has very kindly offered to furnish buses for all of the group that are not going to Stillwater in their private cars. We are going to take Mr. Turner up on that. We certainly thank him for inviting us to do this. Buses will be more comfortable than the SES trucks. We will leave here promptly at



eight o'clock in the morning. I believe the plans are to turn off somewhere just before we get to Stillwater and go out over the area.

Mr. Bergschneider and Mr. Wallace are going to Stillwater tonight and will be there at the turning point in the morning to guide us. Mr. Bergschneider, just where is this point?"

Mr. Bergschneider: "Just about two miles south of Stillwater."

Mr. Chambers:

"We will appreciate both of your being there so that we will not get lost. On the return trip we will stop at the Guthrie Experiment Station at the invitation of Mr. Riesbcl. It is very kind of him to offer this invitation and I am sure that this group will profit by inspection of their methods.

The dinner tonight is at seven o'clock. It will be in the large dining room known as the Commercial room. If you have not registered we would like for you to do so in order that we can make all the arrangements for the dinner tonight and the trip tomorrow. Is there anyone here who will not want to make the trip tomorrow?

Mr. Ramser is probably the Dean of Agricultural Engineers, in soil erosion and run-off studies, drainage investigations and similar activities. He has kindly consented to come from Washington to address this meeting. We appreciate that. We will now hear from Mr. Ramser."

Mr. Ramser: "Before I start reading my paper, it might be a good idea to tell you that we have ten erosion experiment farms conducted under the supervision of the Bureau of Chemistry and Soils in the United States. Established in 1929, Guthrie was the first and has five complete years of records. Zanesville, Ohio, was established about two years ago. We do not have any records



of value from that station which has only that number of years of service.

It takes about two years to begin to accumulate records of any value.

Bethany, Guthrie, and Tyler are pretty complete with respect to grade and length of terraces and a few other points on design. During the past month I have been preparing an outline or summary of all experiments at all of these stations and I am trying to combine them into one experiment. In many experiments there is overlapping and it will be necessary to go over all the experiments in each station to make them conform to a general plan. We endeavor to include in all the phases of experimental erosion control work that needs to be investigated. I do not know of a body of men that could offer criticisms and suggestions better than this body. Those of you here, from your experiences with construction work find out from day to day just what is needed. I have just one copy of this which we will pass around. You can glance over the index and see what should be included and not included. I would like to have suggestions from this body.

I have a rather long paper here. I will just read the parts that will be more interesting."

Mr. Ramser presents paper on "Preliminary Results on Terracing Collected at The Soil Erosion Experimental Stations".

Mr. Chambers:

"We wish to thank Mr. Ramser for this paper. It contained a lot of information in which we are vitally concerned. I was especially interested in the observations regarding the shape of the terrace ridge and of the equipment with which he built them. I think our committee here should go into that fully and make recommendations. It has been my opinion that the Soil Erosion Service in working on demonstrational areas must make real demonstrations of the work we do. It seems logical that we could spend just a little more effort on perfecting our terraces than the farmer would ordi-



narily be supposed to do. We will have some discussions on the papers that have been presented today."

Question: "I would like to be assured that we will get a copy of Mr. Ramser's paper along with the others."

Dr. Winters:

"I will be glad for our office at Stillwater to take over the mimeographing of this paper and we will send copies to anyone who wants them."

Mr. Chambers:

"That is very nice of Dr. Winters to offer to do this. The proceedings of this meeting will be mimeographed and sent to you but in the meantime, if they can mimeograph Mr. Ramser's talk, at Stillwater, you will get it much sooner."

Mr. Chambers:

"We have another representative from the Soil Erosion Experiment Farm at Guthrie, Mr. Riesbol. He has very kindly invited us to Guthrie to look over the experiments. We would like to have him address the meeting."

Mr. Riesbol:

"I consider this a splendid meeting. I have been amazed during the five years that I have been in erosion control work at the wonderful expansion that has taken place in that type of work. A number of you have come into this work in the last two years. We are all dependent on the experimental work that is being conducted. I think we are all pretty dependent upon the experiments by the State of Oklahoma in our particular region and they are all doing right good work. There are a few things



that occur to my mind that you will all be interested in. We all have to use the result of experiments. I wonder if we think of the regulations that enter in on our experiments. Sometimes we think of the comparison of two terraced fields when those fields cannot be compared in the true sense of the word. Then we have cover, of course we all realize the effect of cover.

In Oklahoma we have a very shallow surface soil, the result is we get a very high percentage of runoff. Due to soil differences, there we have another important fact and that is area. You can't compare one acre areas with ten acre areas and find your results are comparable. You can't compare the soil losses because you have a different run-off. At Guthrie we have a long terraced field, the total length is around 700 feet at an average slope of better than 5%. We can compare that with certain terraces on the farm because it represents the total length of slope on that particular field. We have terraces on the same soil where the soil was eroded before we began. We terraced these soils and left the other alone. We have a comparison of extremes. If you take a small plot here of  $\frac{1}{4}$  acre, 100 feet long, you can't compare results on a plot of that length with a terraced field where you have a series of terraces because all this does not represent a total slope with the opportunity of accumulation of flow as you do on a whole field. The comparison of flow must accumulate or your results cannot be compared. On that particular field last year alone which was the greatest drouth in Oklahoma, the soil loss from that area was 110 tons per acre. It was farmed on the contour but it was gullied. On a terraced field a level terrace 650 feet long we had a soil loss of 2 tons per acre. That is a comparison of extremes but I don't believe it is an unfair comparison. Another thing was brought up, the comparison of certain grades



of terraces. The fact is that this fall in an interval between those rains we decided to plow the field, the interval, channel and the grade of all those terraces. That is an unusual condition. It might not be that we would have the opportunity to plow immediately after a series of rains for several years. Regarding the maintenance of terraces; we used to go in with a blade and build them up. Last year at the end of the farming season, the average height of those terraces was around 9 inches. We are plowing those terraces with an ordinary walking plow. We plowed them twice this fall. I have just completed taking terrace heights on those terraces and it is 1.6. This was due to plowing so I think we can frustrate the farmer with his idea that he has to get in there and maintain them with a blade, he can do it with a plow if he will just do it. I extend to all an invitation to come to Guthrie. We shall be glad to have you and show you anything you might be interested in."

Mr. Carpenter:

"That last thing - we have always maintained for a number of years that you could maintain terraces by plowing only. In the Carolinas, Alabama, and Mississippi, we have had terraces longer than any other section of the country. Here is a point worth while using - plow to the center of the ridge. If you keep on doing that for a period of years, you will get the terraces too high and develop a peak-like terrace. You can get around that. On the terrace bench always put your first furrow on the bottom side. Drop down a little bit and into your first furrow and widen that ridge a little every year. Where that practice has been followed, the terrace gets wider and higher each year. Where you don't follow that practice you get



the peak type of terrace or the bench type."

Mr. Chambers: "We have some other visitors from the Guthrie Station. I would like to call on Mr. Lewis who is superintendent of the Station there."

Mr. Lewis: "I came down here to listen. I know you are doing a wonderful work. I would like to make a statement in regard to strip cropping at Guthrie. I want to show you some of those stripped crop areas tomorrow. We have some strip cropping results up there that we feel are just as safe as any terracing results at the station. We will be glad to have you up there tomorrow."

Mr. Riesbol: "I had no intention of running down Mr. Lewis's experiments. I think we have talked this over a number of times and we are pretty well satisfied that they can strip crop on one acre areas. Those one acre experiments are field experiments. I believed what I tried to point out is that we must be reserved in comparing results generally anywhere in the country. Slope and length is a very important factor. We have a great deal of respect for the other fellow's accomplishments. I was not criticizing Mr. Lewis. We are both working on the same problem."

Mr. Chambers: "I understand the state cooperates with the federal government in the work being done on the Soil Erosion Experiment Station at Guthrie. We have Mr. Slosser, agricultural engineer for the state on the Guthrie Station. Mr. Slosser."

Mr. Slosser: "I do not have much to say except for one thing. We have pretty well gone over everything in the papers that have been presented on contour farming, building of terraces and proper plowing. It seems to me that we could give some more thought to plowing up hill. We move approximately one-half of the interval which is plowed down hill, assisting



eression to that extent. If we would use some type of two-way plow so that it would move all the dirt up hill, we would be diverting erosion to that extent. At Tyler some measurements were made and the earth deposit in the channel was just about the amount of a furrow slice down the channel. If that had been plowed with a two-way plow with all the soil moving up hill we could have saved that much soil. It occurs to me that moving all the soil up hill from the channel to the peak of the next terrace, we would save the gradual movement down the slope of the soil.

Mr. Chambers:

"These are good observations by men in this work and we are certainly glad to have them and we want them to feel free to make any suggestions that they care to. Mr. Elwell is agronomist at the Guthrie Station who is representing the State there. We will hear from Mr. Elwell."

Mr. Elwell:

"I haven't much to say except that coverage is one of the chief things in controlling erosion. I have quite a lot of pleasure in getting organic matter back into the soil in controlling erosion. At Guthrie with sweet clover, vetch, and winter legumes, we are building up our soil and adding plant food to our soil by the use of these plants in helping soil erosion."

Mr. Chambers:

"We have several old friends with us today whom most of us have met at our projects from time to time. We have not heard a word from them. I have been hoping they would say something. We would like to hear from Mr. Murphy of the Caterpillar Tractor Company."

Mr. Murphy: "I didn't expect to be called upon to talk to this group. It is rather unfair to bring machinery men into your presence and allow him to listen and then make him talk. It is a sincere pleasure to be here with



you and study all of these problems which are getting more study now than ever before and I think probably all of us in the machinery business have a lot of things to look forward to. Erosion control measures that have been used in the past are probably going to be expanded and the machinery man is going to have the opportunity just like the other engineers to help cope with the soil erosion problems. It has been a great help to come to you men and get the facts. There is no substitute for facts. We have our own educational programs which we try to carry on to keep the machinery working along the same line. Those of us who are in the agricultural engineering end are trying to keep up so that if we meet these problems in the field, they are problems which will be considered from the agronomist's standpoint, the hydrologist's, the soilman's, the horticulturist's, and also forestry and engineering. We have recently prepared a little booklet which I would like to have you men criticize because it is something that will go out as a commercial organization send their booklets out in a certain way, naturally to sell machinery. In our industries we want to cooperate with the good work you are doing and in the long run get the results that you are looking for. I ask that all of you help us as machinery people to talk the right language, to prepare the right kind of literature to put our factories before the people which will do the largest amount of good."

Mr. Chambers:

"Very nice. Mr. Murphy. These machinery men have a lot of information that we can use. We will now hear from Mr. Moon of the Continental Rolled Steel & Foundry Company, Chicago, Illinois."

Mr. Moon: "As to much information, I haven't any. I came down here to get some. At the present time we do not believe we build equipment that is practical for



terracing. For the past year we have been studying the Soil Erosion Service and what you need. I told my chief, I am going to take a week off to find out what you need. I didn't come down here to sell anything but I came down here to see if we could reverse the system that has been working in the past. I am in the Sales Department. Our engineers have been building it and saying sell it. I want to reverse that if I could. I thought maybe if you men would tell us beforehand what you wanted we might build it instead of our building it and telling you to use it."

Mr. Chambers:

"We will now hear from Mr. Turner of the International Harvester Company."

Mr. Turner:

"I feel something like a lady driver who had just had a smash-up. A policeman asked her how it happened and she said it was the first time she had ever driven a car from the front seat. This is rather the way I am. It is the first time I have ever been in the front seat in this kind of activity. I agree with what has been said by Mr. Murphy and Mr. Moon. You are establishing something in the furtherance of agriculture and there is the matter of construction equipment and farm equipment that will farm the land that you are conserving. My main object here is to find out just what the requirements are going to be on our part and keep in step with what you folks are doing."

Mr. Chambers:

"We will now hear from Mr. Hoover of the Cleveland Tractor Company. Mr. Hoover was on the Illinois project until some time ago when he left us to accept a position with the Cletrack."



Mr. Hoover.

I am very grateful for this opportunity to be here. Like all the folks in this room, I am here to learn although from a slightly different angle now. I am going to take the liberty of speaking for all the equipment people here in this room. We are anxious to learn the job of constructing machinery in order that the Soil Erosion Engineers can improve the work they are doing. I do hope to attend the committee meeting and if I can offer any suggestions you will be assured that I will not keep still."

Mr. Chambers:

"Mr. Wilson of the Austin-Western Road Machinery Company is here also and we will hear from him."

Mr. Wilson:

"I want to thank you gentlemen for the privilege of being here and attending your meeting. I have visited several of your projects. We have been building terracing equipment along with our machinery line now for four or five months. We have made several constructive improvements in our machines since conversing with these engineers on these projects. I consider being here a liberal education and from what I learn here we will try to build still better machines."

Mr. Chambers:

"Next we will hear from Mr. Noel of the Allis Chalmers Mfg. Company."

Mr. Noel:

"I am about the last machinery peddler that will have the opportunity so I had better make the best of my opportunity. They wouldn't walk more than a mile to cut my throat and I wouldn't do any more for them. I have been trying to develop some terracing equipment and I appreciate the efforts of all you men have shown toward us. I believe we are going to have some nice machinery to offer you and I am going to learn some more about this business and I thank you for this opportunity."



Mr. Chambers:

"We will now hear from Mr. Griner of the J. D. Adams Company."

Mr. Griner:

"I imagine when the meeting is getting slow some of us equipment men can liven it up. Our company is a new company in connection with terracing work. We have manufactured dirt moving machinery for some fifty years but we have never had any contacts with farmers; consequently, we know very little about the job of terracing and other problems in connection with soil erosion. It was not brought to our attention until your organization started to function in the way that you did. We are trying to learn by visiting all of your various soil erosion projects, the experiment station farms, etc. We are very well pleased to receive an invitation to be here and are glad to learn. We can't claim to know much about competing with soil erosion engineers except from the standpoint of machinery design."

Mr. Chambers:

"Have I overlooked anyone, If there are any other companies represented here, we will be glad to call on them. While we are on this machinery question, it seems that the time is too limited to get all of today's program in. While we are on the subject of machinery, Mr. Clark would like to say a few words to you on the purchasing of equipment. He is from the Washington office."

Mr. Clark:

"I have been just almost afraid to let you know who I was. I knew you have had a time getting equipment. You cannot build terraces with sympathy. There are just a few things I want to mention. It would not do for a man to come down here and not say something. There may be some questions that you will want to ask. I will answer them if I can. There are a few things that we consistently run into. I want to bring these to your attention very briefly so that you can help me to help you. You fellows realize that you use a lot



of equipment and that you have pretty good sized projects. Multiply that by 25 or 30 and move that into one office and you can readily imagine what a problem that would be. You fellows have had no experience in Government purchasing. It is impossible for you to visualize the size of the Washington work unless you have actually been there. I have just a few matters here I want to bring up. The first thing in ordering equipment is to be very specific in ordering what you want. There are some things that are pretty well known in your locality. I happen to be from the Southeast and I don't know about everything that is well known in the Middlewest, so those terms do not mean much on a requisition. I will give you an illustration. The other day I received a request for a certain kind of cultivator. That man thought that that cultivator was so well known that we would not have any difficulty at all in buying it. I turned to the Buyer's guide and found that a certain concern made the cultivator but it did not give what kind of cultivator it was. I wrote to that concern to get some information on that cultivator. When the information came back I found that it was a garden tractor. When sufficient information is not supplied, I have to write to every one of the manufacturers of each article requisitioned. It may take two weeks in getting the information from all of the manufacturers and then we can proceed to draw the specifications around the item wanted. They must be drawn in such a manner that it will not eliminate another machine that is equally satisfactory. If you have a circular about the piece of machinery you want, send it along with your requisition. In ordering a two inch cylindrical pump, state size, inlet or outlet, and what speed or pressure. We don't know whether it is a pump to deliver a large quantity of water against a low head or a small



quantity of water against a high head. There has been the idea that the Washington Office does not want you to have equipment. You can get almost any equipment you need provided you and the Regional Director agree on that equipment and justify it. Of course if you send in a requisition for half dozen trucks, someone is going to ask questions. The best way to save time is to attach to that requisition a letter saying why you need that piece of equipment. If it is a tractor and if you have so many lines laid out and no machines to build terraces with, that should be gone into. You should have the equipment you need but do not over buy equipment. It is not because we do not want you to have that piece of equipment but it is because we must know how this equipment is to be used and justify its purchase. When equipment is received, I notice that there is a laxity in checking against specifications. We don't see the equipment. You men are responsible for receiving that equipment. You should have your specifications before the equipment is received. If you know the contract has been awarded and you know it is coming you should look these over carefully. If you don't have a contract write for it or wire for it. Read them over carefully with the specifications and go out there and check the equipment against the specifications. Don't just glance at the specifications, read them over carefully. We have received in a number of instances equipment that does not meet specifications and then we tried to get it ironed out afterwards. That is almost impossible. We are trying to standardize our specifications as much as possible to get the same kind of equipment all the time. On our surveying instruments, we have done that and we think you are going to get very satisfactory equipment. In terracing work we have developed recently specifications for a new dumpy level. It is a level that costs about



\$40.00. I think they will prove to be very highly satisfactory instruments for terracing work. It is substantial and strong and from the sample looks very good. For gully work you need an instrument for running out drainage areas. We have gotten up a specification for a universal level which can be used for that work. In addition to those two instruments we have transits. We don't do a great deal of transit work. We have two types. One type, the Mountain or reconnaissance type, is rather a light instrument and is accurate enough for most purposes. The cost is from \$175 to \$190. Then we have an engineers transit which is more expensive instrument and I see no reason why there should be more than one on each project. It costs around \$375. Recently I sent out some record sheets in order to keep records on tractors. The purpose of keeping records on tractors is to determine the cost of building terraces. In order that we may be able to compare data in Washington with data kept in the field, it is essential that data be kept in a uniform manner and reported to Washington in a uniform manner. I am sure all of you have records but suppose we asked you to send your records into Washington and we tried to analyze them. Everyone's records are different and it is practically impossible to compare any data that will be worth anything. We are trying to keep uniform records over all the projects. In buying equipment if we can have data on cost of terracing operations with a certain equipment, we can buy the equipment that is the most economical. In other words, you can order certain equipment and justify the buying of certain equipment owing to the cost of operating that equipment. The sheets for reporting the records to the Washington office have not been sent out. We got out one sheet and thought it was right but after we had the sheets made up we found we had left something



off. I hope to get those out within the next week or so. Do not make any reports for the month of January until you get these sheets. Get the reports in the last of the month or the first of the next month. It doesn't make any difference how you keep your records so long as you get the reports into Washington. If there are any questions that anyone would like to ask, I would be glad to answer them."

Question: "In putting in the cost of operating tractors and graders, do you include the cost of the two operators? Is there any way of figuring the cost of operating tractors and graders separately?"

Answer: "I am glad you brought that question out. That is the thing that we had left off. We left off the machine that is being operated, - the grader. Unfortunately, the tractor record book does not segregate the cost of the grader and tractor but on the sheet to the Washington office we have one column for the type and make, next is the depreciation. There is a column for the repairs and there is a column for the operator of the machine."

Question: "That was one question I had in mind. On your Form 1266, you have the cost of repairing. I want to know if that means the number of working hours that the driver has done that you charge against. If the driver works 8 hours and if the tractor worked six hours and breaks down, the other two are spent in repair and some man works over time that day, how would you show the four extra hours?"

Answer: "You have a place there for the time lost. If it breaks down and you are doing nothing about it, you should show time lost in your report. Suppose you have two mechanics that work four hours, then the hours of repair would be 8 hours."

Question: "I would like to know if there may be any improvement on the time



of deliveries. We are having long delays. We put in an order the day before Thanksgiving and to date we have not received the machine. We wired Washington asking if we could get any information on it. It happened that it was a road ripper. I am sure that we were right in our specifications. We ordered one and hoped that it would come within six weeks."

Answer: "I know exactly what you are up against. It is impossible for us to tell how long it will be. One order will go through in two or three weeks, another three months. We think today we are going to get a contract awarded but today something may happen to prevent. The only thing I can see is for you to anticipate your wants a long time ahead. I am trying to keep stuff on contract. What I would like to do is to have a contract to draw from at all times."

Question: "One question. Would it be possible for us to be notified before the contract expired? If we knew when a contract would expire we could order that material in time."

Answer: "That is true and occasionally when we have contracts expiring, we do notify you that we have certain equipment on contract that is expiring. We can't always notify you and the best thing to do is to get in your requests as quickly as possible."

Question: "Can't we get the specifications on different materials in the field to put on our requisitions so that we can get our materials more quickly?"

Answer: "Don't try to write a specification that could be written into an advertisement. Tell us definitely what you want. Don't try to write the detailed specifications that you would put into an advertisement.



We will have to rewrite it anyway. We have more information from which to write specifications than you do. In writing specifications in many cases after it has been built up over a long period of time something happens and it has to be changed."

Question: "Would it be possible to be informed in the field how long the delay will be in getting your material? It is something to know just how long we will have to wait on our equipment."

Answer: "We can't determine how long the delay will be. We think every day it is a matter of a day or two. I am sorry we can't give you that information."

Chambers: "We might advise the field whether that particular machine or piece of equipment is on contract. Where you have to advertise for bids, it will be three months at least before you get your equipment."

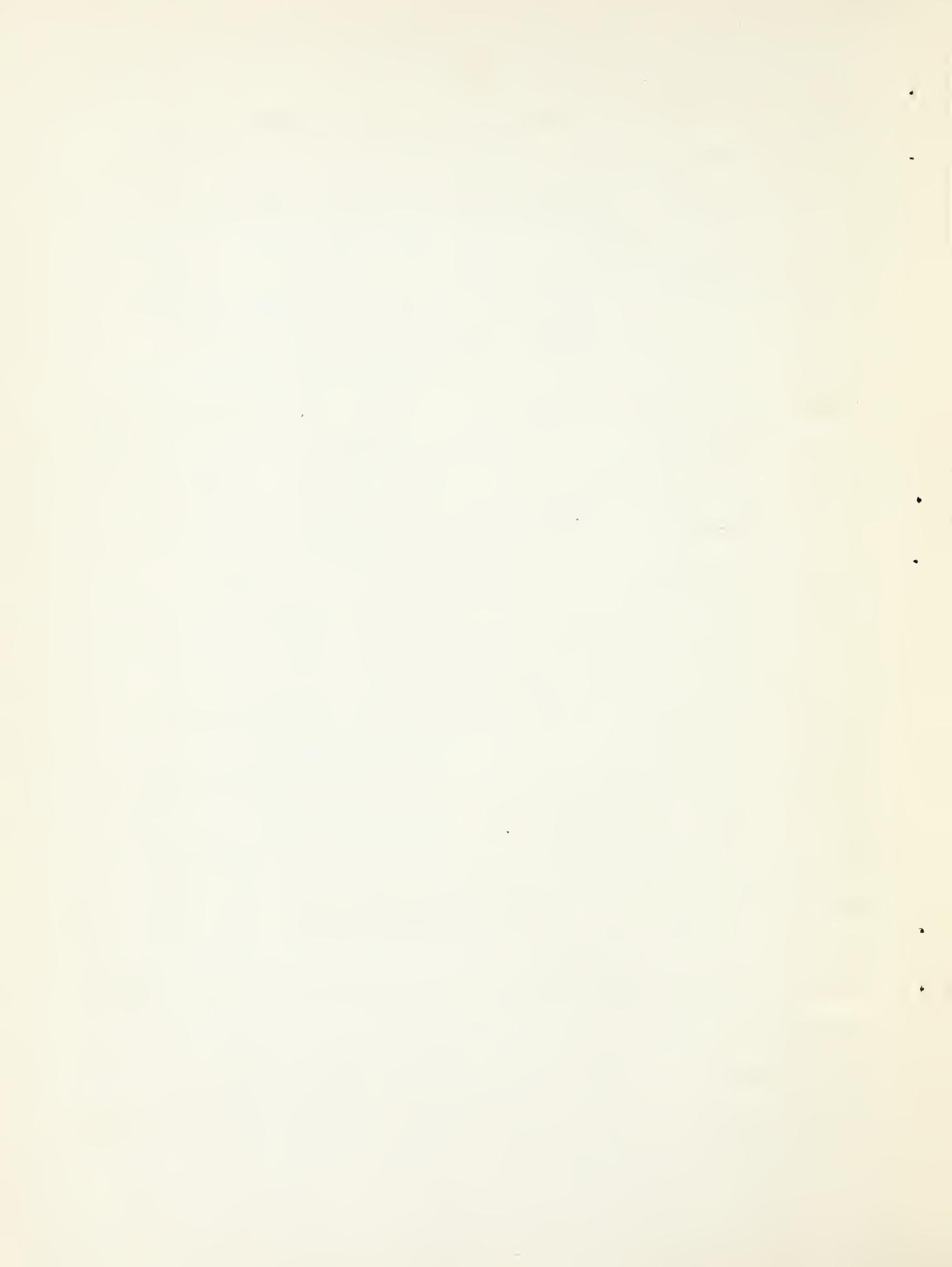
Clark: "Yes. We can do that. Even that is not always true. As in the case of some trucks. For thirty days we thought we could get them off of a certain contract and at the end of the thirty days, we found that we had to readvertise."

Question: "We requisitioned for a 9 foot grader and when we got the order we did not get the right size blades."

Answer: "That question of those blades on the terrace machines is a difficult one to get ironed out. We have been working on it for 60 days and have not got it yet."

Question: "We have a number of chevrolet coupes. They did not come with a rear bumper."

Clark: "That was probably left out of the specifications. Things that are left out should be called to our attention. We do not see the machines."



Question: "Will we get these bumpers later from the manufacturer?"

Answer: "If it is not on the specifications, it will not come through."

With that particular machine you will not get a bumper. There are a good many orders in for those machines but we would like to get away from it if possible. Don't be surprised if you get a regular one-half ton pickup truck. It may not be as comfortable to ride in but we would like to get away from that machine, as much as possible."

Question: "Will there be any way for us to get the right blades?"

Answer: "Right now on those blade lengths we are trying to settle that in Washington. Anything you know we are working on do not take any action on it in the field. If it comes within your allotment you may do that unless we are working on it is Washington. Don't start something in Washington and then take action on it in the field. Are there any more questions?"

Question: "I have not heard any instructions as to what records are to be kept on the survey parties. Is that kept in a notebook? We build level terraces only and we keep a record on them."

Answer: "Most of the projects do keep a level book in which they keep the actual readings as the terraces are being laid out and as the terraces are being constructed. Does that answer your question?"

Question: "That answers my question. Can we get those level notebooks?"

Answer: "You can get them from the Washington Office."

Comment: "I ordered 24 dozen in July and haven't got them yet."

Answer: "The new schedule has just come out the first of February."

Chambers: "Thank you, Mr. Clark. There seems to be some question as to what the fall should be from the terrace outlets into the outlet ditches and as to



whether the depth of the water in the outlet ditch should be taken into consideration."

Question: "If the depth of your water is designed for 8 inches and you are planning on a six inch fall on your last 100 feet, should your fall include that 8 inch depth of water?"

Answer: "That question was referred to yesterday and we hope to have the committee on terracc outlet construction make some definite recommendations on this. Some of the projects are using as much as one foot depths between the bottom of the terrace channel and the bottom of the outlet ditch. Others are building them flush. It seems to me to be the wrong thing to do. Mr. Ramser has made some recommendations on that. I would like for Mr. Ramser to tell you about it."

Mr. Ramser:

"I think in the 8 inches the idea was to use 4 inches without vegetation. Vegetation ditches increase four inches to allow for growth of vegetation in the bottom. I am of the opinion that 8 inches should be the maximum but there will necessarily always be water in your outlet ditch."

Question: "That grade should never be increased along the terrace?"

Answer: "No, we don't think the grade should be increased in any event."

Question: "Do we need anything in the way of a drop?"

Answer: "We would like the committee to make such recommendations on that as they can. We have had opinions and data from these Soil Erosion Service Engineers on that and if the committee will make recommendations we will use it until it is proved that our recommendations are wrong. That is the best we can do."



Question: "I would like to add a question and it seems that it applies to some of the others. They shipped the Cletrac 45 tractors out with gasoline heads but the specifications said they were to have kerosene heads and the company changed them to kerosene heads. We would prefer the gasoline heads on these tractors. We are running them with gasoline but they have kerosene heads. The upshot is that the Cleveland Tractor Company is working on these tractors. They will put the gasoline heads back on free of charge. Will it be necessary to get authority from Washington on that or can we go ahead and do that? All we need is the authority to do it."

Mr. Clark:

"You are at liberty to do that where there is no money involved. There was a mistake in having these tractors designed with kerosene heads. When you received the purchase order and it indicated kerosene heads and you want the gasoline heads, you should get it corrected. If you don't want them as specified, don't accept them, or if they don't meet the specifications. We don't mind the kicks. I want to know how the equipment is working and what kind of service you are getting from it."

Mr. Chambers:

"Any other discussion on terracing? If not, we will adjourn for committee meetings. I know you are all tired. Most of the Soil Erosion Service Engineers are on these committees. We have not included very many of the E.C.W. men on the committees. There is no particular reason for that. We will be glad to have you in these meetings. These committees will give their reports in the morning. Is that clear? Friday morning we will meet in this room at 9:00 o'clock. We will now adjourn."



Thursday A.M. February 7, 1935

Mr. Chambers:

"Gentlemen: The weather is so bad this morning that we will not go to Stillwater. I am sorry that we did not get to go today. There is only one thing to do and that is to go on with tomorrow's program today. We have a short paper by Mr. Beamon and some of you will want to make suggestions and ask questions about it. The committees will be given part of the morning for further meetings and we will meet this afternoon and discuss the reports of the committees and consider their recommendations. This conference will be adjourned after meeting today. If the weather is favorable tomorrow, we will make our trip. If it is raining tomorrow, we will make it optional. We would like to have a paper by Mr. Beamon. This is an instructive paper on drafting room methods and reductions from drawings and tracings. Mr. Beamon is Chief Draftsman in the Washington office."

Mr. Beamon:

"This paper I have here is rather dry as it is written primarily for draftsmen. You are going to get it just the same. You gentlemen probably will not be interested in this work so I am asking you to pass this information on to the draftsmen on your project. I will pass samples of the blueprints around so you can see what is what."

Mr. Beamon presents paper on "Standard Methods of Making Reproductions from Tracings and Drawings".

Mr. Chambers:

"Gentlemen: That paper was given purely for your information on the projects so that you would know what service is available in regard to



different kinds of prints. If you are in need of a large quantity of prints, you may send your drawing in to Mr. Beamon and specify what you want done with them or what you want to use them for and he will know what kind of prints you need."

Mr. Carpenter:

"You made the remark yesterday that Mr. Beamon has a standard size for his prints and tracings in the Washington office."

Mr. Chambers:

"Anything you send to Washington we will have reprinted to fit the file."

Mr. Carpenter:

"We are using the American Society of Engineers Standard sizes. We would just as soon use some other size if Mr. Beamon will recommend and tell us what size he is using we could use the same size."

Mr. Beamon:

"I have a list of different sizes, which we have developed. L. size, 8 x 10 $\frac{1}{2}$  inches. Try to make everything that will reduce down to letter size. N. size, 10 $\frac{1}{2}$  x 15, it will fold one time to a letter size. O. size, 15 x 23 inches. P. size, 24 x 30 inches. S. size, 30 x 42 inches, when anything gets beyond the S. it is too large to be filed flat. R. size, everything that cannot be filed flat we roll and file in pigeon hole. You can slide the try out and pick up any drawing. We find that these 6 sizes take care of anything."

Mr. Carpenter:

"Write us a letter about this and give us these different sizes."

Mr. Beamon:

"We hope the committee will take that up and standardize these practices. We are going to send this information out from the Washington office



as soon as we can find out exactly which men on your projects are supposed to get this information. We have been having trouble with the material sent out not getting to the right people and not doing any particular good. When we get this information, we will send it out from week to week."

Question: "I was going to suggest a standard set of legends and symbols."

Mr. Beamon:

"That is one of the things we hope this committee will straighten out. Naturally we cannot work out standard symbols without knowing each of your problems. As soon as we find out what you are using, we will get together a group of standard symbols."

Question: "What size photographs should we send in to appear in the publication "The Land"?"

Mr. Beamon:

"It should be on a size to reduce down to half a letter size sheet. It doesn't make any difference if it is the size of that blackboard if the lettering on it will take that much reduction."

Mr. Chambers: "Keep in mind that Government standard size stationery is 8 x 10 $\frac{1}{2}$ . Other is 8 $\frac{1}{2}$  x 11."

Mr. Chambers:

"We have a short paper scheduled from Mr. Mathews of the Navajo project. He has very different problems from most of the other projects with the possible exception of the Gila project in Arizona that is just starting out. We would like Mr. Mathews to tell us what they are doing on his project. This will be interesting to most of us. We will now hear from Mr. Mathews."



Mr. Mathews:

"Mr. Chambers, Gentlemen: This Navajo project would make some of you jealous but at the same time there are some points that you would not be jealous of since we have to deal entirely with Indian labor and a primitive people."

Mr. Mathews presents paper on "Engineering Phases of Work of S.E.C. on Navajo project".

Mr. Chambers:

"Any discussion on those points Mr. Mathews raised? I am sure everyone was very much interested."

Question: "Do they pay these Indians like they do the laborers on other projects?"

"We pay 30¢ per hour for ordinary labor, \$6.40 per day."

Mr. Chambers:

"We have one or two projects represented here that are quite different from the general run. We don't want any long discussions but these men are here and you won't see them for a long time. I am wondering if they would give us a short discussion of what they are doing on their particular projects. We will call first on Mr. Johnson, the Engineer from Fullman, Washington."

Mr. Johnson:

I really appreciate the opportunity of speaking to you men about our project. I have been feeling all the time that I would like to tell you about it. It seems that we started in with some pretty tall stories and I hesitated to speak. Our project seems to me has two differences that are important. One is the topography of the land and the other is our tillage methods. The topography there is very irregular. Our slopes extend up to a maximum of 60°. A considerable part of the area that is being farmed is about 50%. The average is around 20%. Another



main difference in our project is the tillage methods. Summer fallowing and wheat rotation. When it was proposed to put our project through in 18 months, immediately the question came up of how we could have the two year cycle in 18 months. An arrangement has been made to take care of that. The thing we are troubled with is sheet erosion. We find that sheet erosion would take place on narrow strips between terraces if we would attempt to terrace. Our experiment station is measuring its erosion loss on strips about 66 feet long and it amounts to as much as 35 and 40 tons loss per acre per year, per summer fallow year that is. You people have the difficulty of row crop cultivation where the ground is cultivated during the rainy season. Our rainy season is in the winter months. November sees the heaviest rainfall with considerable rain in March and April. The minimum amount being in the middle of the summer. Our fields lie in a cultivated condition during the winter months. This has caused our sheet erosion. The most important remedy that we could apply is the system of farming so that we would not have a season of cultivation during the rainy months. Our land is plowed early in the summer and the crop is sown in the fall of the year in September and October. The crop does not get a good start during the fall probably not rooting over 2 or 3 inches deep. During the winter months, that is the second winter that nothing has grown on the land, we have our rainfalls, a very gentle rain usually, but which amounts to 20 inches on an average on our project. This causes very destructive sheet erosion. The fields loose 15 to 25 tons per acre during that rainy season. Without further cultivation of the ground, the harvest must be taken care of that year. The industry of welding is very important



in that country simply because we break up our machinery so much owing to our rough fields. The blacksmiths are spending most of their time in repairs because the condition of our fields during harvest is so rough. When the field lies in stubble, there is no erosion. The loss in tons per acre is a fraction of a ton. There is practically no runoff when the field is in stubble, while the runoff is as much as 40% when the fields are fallow. That is the principle difference it seems to me between ours and these other projects. I would like to have you all come out here and see our country. We anticipate some expansion and we have to consider public domain range and forestry. We also have the problem of wind erosion and we are taking steps to remedy it."

Question: "What machinery predominates in that region?"

Answer: "Our farms average 200 acres and many of our farms are running into 1,000 acres. The combine is the principal machine. The track laying type of tractor is also used. 60% is being farmed with power. The units are very large."

Question: "I happen to live in the Western part of Kansas where summer fallowing is continually practiced and I am wondering if you try to use the chisel in the summer fallow work."

Answer: "One of the activities which is just starting is a tillage project. The director told me I had to get all the machinery available so that all of the heavy stubble we have there must be worked into the ground to form a binder for this winter season. We are going to try all types of machinery. The principal one I believe will be the heavy disk with 14 inch cup, 26 inches in diameter and 9 or 10 inches spacing. In-



stead of tunning it under we are mixing it with the top soil. We expect results from that method. We have also tried the rotary chisel that is manufactured locally. It is attached to the plow beams after removing the mold board. On the soils on which we have tried it, it has not been successful. Our agronomists say that it is not necessary to subsoil if a deep rooted crop is grown at least once in two years. It is doubtful if the chisel will be profitable on our project. Another thing we have to take care of is scattering straw. For this a wheel is attached to the back of the combine. We have to harvest with a tail wind there. This is a machinery project and that has got to be a part of the work."

Mr. Chambers: "Will you tell us what you are doing on those steep slopes to control erosion. What practices are you following."

Mr. Johnson: "Instead of strip cropping we have been strip seeding. This consists of seeding a strip of wheat in the summer fallow field early in the season. In our case the variety of wheat is Albet wheat. This wheat is a hybrid produced in the North west. It is a smut resistant wheat. We seed it in the spring and it grows up about 12 inches and does not mature during that summer. It must go through a winter season. We seed one drill width at strips approximately on the contour about 50 to 200 feet apart according to the steepness of the slope. These strips will grow up then and form a good dense root growth during the season. They act very much like terraces. The sheet erosion is interrupted at these strips. The material is caught in the strip and the water goes on through. Any gullies that are formed are interrupted, the wheat acting as a spreader. This is about as near as we can approach to terracing in that section. It is sufficiently controlling our rainfall which is 2 inches in 24 hours maximum



and 20 inches during the season. It is preventing gullying and to a large degree sheet erosion.

Question: "How long has that land been in cultivation?"

Answer: "About 30 crop seasons. For the first fifteen years it was cropped every year, the next fifteen years summer fallowed. Next they summer fallowed one and cropped two years. It is necessary now to summer fallow one year and crop the next. The pea crop is becoming a very popular crop. We have Canadian field peas and Alaska peas. One is a dwarf variety with very little straw and the other is a heavy straw variety. It makes a very good material for our straw dams. It is a catch crop and they claim that it does not deteriorate the soil."

Question: "Do they turn it under for soil improving?"

Answer: "They are burning it if we don't watch them. We combine them in the fields."

Question: "Have you used the pocket digging cultivator?"

Answer: "We have one we are going to try in the flatter low land areas. It has not been successful because the hills are too steep."

Question: "Do you direct the furrow down hill all the time?"

Answer: "Yes. We were asked to report how many acres were contoured farmed. I wrote in 100%. That is the only way they can farm. We use the ordinary one-way plow."

Question: "In the Washington area, do you have meteorlogical maps as on other projects?"

Answer: "We have a change in elevation 18 miles of about 1800 feet. We have a number of buttes in the project which stand up above the surrounding country which we believe have a peculiar effect on the climate."



The southwest wind will strike on one of those buttes with a meteorological result. Sometimes we have as much as 4 inches of rain in 20 minutes. We have about 40 rain gauges on the project. We are able to purchase the forestry type rain gauge for \$1.50. It is manufactured in the west. We have these in the hands of farmers who cooperate with us in taking the records. We have 5 recording gauges. In addition to the rain gauge, we are making a ground water study. We have 26 wells on the experiment farm for the purpose of studying ground water conditions. We have about 16 or 18 more in the area and readings are taken on the water levels in the fields once each week. The indications are that the ground water table has gone down 40 feet since the country was settled up. We have a number of stream gauges all over the country. We have four water stations and we have a gauge station on each one of those because of the different types of farming. We have one quarter section that is 100% two year rotation farming. We have two forestry areas. One is in Section 9 which is terraced 250 acres furrow terraces. We have a gauging station at the foot of it. We have considerable fills. The snow in the mountains is about 40 inches. Once a week we make snow surveys. The ordinary method of determining moisture in the form of snow is not practical for our purpose. We therefore adopted the snow sampling and the weighing method of determining the quantity of snow and the amount of water that is present due to snow. I believe those are all of the features we have there. We have a U. S. G. S. man cooperating with us and this work is his responsibility."

Mr. Chambers: "Thank you very much. I am sure we all enjoyed your talk. We have only one wind erosion project and that is located at Dalhart Texas.



We would like for Mr. Reynolds to discuss his project."

Mr. Reynolds:

"This wind erosion project is located in the northwest corner of Texas, about 30 miles from the Panhandle of Oklahoma. This station has a rainfall of about 18 inches a year. The elevation is 4,000 feet and of course it varies some. The land is what you would ordinarily call almost level. The plain looks level but it drops from 15 to 20 feet per mile. The farming is wheat and grain mostly. The farms vary in size from 1/4 section on up to a good many thousand acres. They do not recognize section lines, they drive anywhere in the country. There are no fences. The erosion is due almost entirely to the wind. It doesn't roll enough to have gully erosion as most of you do where you have heavy rainfall and more sloping land. The land would not erode if the grass would have a chance to stay on and they did not overgraze. Overgrazing causes the soil to blow away. It is very common to find patches of land from 20 to 100 acres where all the soil is blown off as deep as it is plowed. The soil blows off as clean as a table top. When the wind blows the soil piles up against the trees and buildings and any place it will hold. You might wonder if it is a certain type soil. The sandy loam blows worse but even the tight lenses will blow also if you don't keep a vegetative cover on them. We have found Russian thistles that have caught the drifting soil. We call these places hummocks. An ordinary truck can run along there and hide. To farm we run a tractor over these areas. We drag a disk harrow which cuts up the vegetation there. It will mix with the soil and then we smooth it down the best we can. Then we list it. On soil that is completely bare where the loose soil is blown off, they go ahead and seed it and endeavor to farm it. The big problem as you



have probably got it is to keep vegetation on the land and if you keep it, the land will not erode. There are two things that we are doing to bring this about. The first is to terrace. The object of terracing is to stop the water in its tracks so that it will never run off. The lands looks level but it is not level. Some of our steeper slopes are about 3 feet in 100. These terraces are not the kind of terraces most of you build but they are enough of a terrace to back the water up to the next terrace. The terraces run  $\frac{1}{2}$  feet to 1 foot above the ground. We don't bother with the terrace channel. It might be a channel now and in thirty minutes it might not be a channel because of the wind blowing the soil. I have lived in the East and North and it is hard to realize that you can plow a furrow and in an hour the wind will blow it flat. We have less erosion where there is the most water. We will have more vegetation there. These terraces will have the same elevation at one end as they do at the other and we close the ends. We run all the water on the land that we can get by diversion ditches. Water is the limiting factor and is what we want. The only way we can keep the soil is by moisture conservation. The way we help the farmer get his land back into vegetation and keep the soil from drifting is to strip crop. A few experimental stations have done this in this region. We are planting wheat in between these terraces. The strips of grain crops have served to keep the soil from shifting. These strips are stopping it. It does the same for shifting sand, as it does in the East for water. We are supervising very carefully the grazing of wheat. These farmers have entered into contract to cooperate with us and the agronomist keeps close tract and we are expected to report any harmful grazing. We had one man who sold his grazing rights for \$500 for one-half section of wheat. He is going to



be rather hard to deal with. There are no feed stacks. The country is devoid of feed. They have had no crops in the last three years. The weather records show that these have been the driest years that they have ever had. It is hard to get a crop to grow where the wind whips it to death. Our main problems are holding the water where it falls and not letting any vegetation get off the land."

Question: "Is it possible for you to hold all the water that falls on the land in the terraces?"

Answer: "Yes. The biggest rain that we have recorded is 4 inches in 24 hours. We are trying to compute the height of the terrace in such a way that one inch would soak up and the terrace would actually hold three inches of water.

Question: "Are you pretty certain of a crop?"

Answer: "There is nothing to dry farming. You have to have moisture there in order to grow crops. However, we have had a 34% increase on terraced land over unterraced land."

Question: "Don't they have the same conditions at Spur Texas?"

Answer: "Spur has about 4 inches more rain than we have. We are using the data from all of these stations in our calculations."

Question: "Have the experiment stations made any crops in the last three years?"

Answer: "Mr. Finner is Director. They had only nine inches of rain, but there were few crops ruined in this project. One man sold several thousand acres of bundled feed. These bundles are about 6 or 8 inches in diameter and they get 5¢ a bundle for them."

Question: "Do you have any trouble with the wind blowing the land after the terraces are built?"



Answer: "If it is too sandy, the land has a slope of 2 feet to 100 and we saw that it was losing water. We want to hold the water where it falls. The drainage of the country is in the inland lakes. There are 20,000 acres in this project and there are 370 acres of lake bed. When we have a rainy season, it will rain 3 to 5 inches in 15 days coming in September or May and we find these lakes will get 2 feet deep and that is the drainage the country has. Now our idea is to never let the water get to these lakes. We plow miniature terraces to hold the water in pasture lands.

Question: "Do they summer fallow for wheat?"

Answer: "No. They don't do that anymore. The Goodwell station tried that and they found that it didn't pay. I do not know just what the scientific reason for it is but I know that Mr. Firrel has made that statement. I don't know that problem like a lot of people do."

Question: "While we are discussing this machinery, I would like to know if anyone can give us the method of how we might use this pocket digging cultivator."

Mr. Chambers: "Bring that up in your committee if you will, please. If there is no further discussion, we will get on with the committee work. Anyone else having anything to bring up? Is there any discussion from the committees before we adjourn for committee meetings? If there is, we would like to hear from the Chairman of these committees."

Mr. Carpenter: "Fellows, I suggest that we adjourn to start our committee meetings."

Mr. McAlister: "We appointed a subcommittee to report on various subjects under discussion in the gully control committee. I would like for that committee to be back here in this room in about 30 minutes after they have



had time to decide on what they want to report."

Comment: "We haven't had time to do much on this. We would like to have a little more time.

Mr. Chambers: "I might say before we make definite dates that we can give you some time this afternoon for these committee meetings. I had in mind to call the reports of the committees at 3:00. We want to take up each point and have it considered.

Comment: "The Bureau of Public Roads is taking some action on the emptying of water from the fields into the roads. We realize the problem that water disposal has on our terracing program. We might get some advice from the men who are in Washington. Maybe some on the project could help formulate similar ideas and do some similar work. We haven't gone far enough yet. It is a big job to control that water from our road ditches and from the road ditches down to the next field."

Mr. Chambers: "I move that you as a committee look into this matter and give us some more information as to what is done and contemplated by the Bureau of Public Roads and make suggestions as to the action that we might take to further their work."

Comment: "I overheard a conversation by Dr. Lowdermilk that he had made arrangements with the Bureau of Public Roads to go into this matter. This action that is being taken now is the result of Dr. Lowdermilk's good work. Dr. Lowdermilk probably would have some information that could be passed on to you people."

Mr. Chambers: "If you have a chance to cooperate with these highway engineers, don't fail to give him all the knowledge you have and take advantage of all the knowledge they have in the methods of taking the water away from the highways. Your committee can make suggestions for proper method of handling the water. Now in view of the fact that we have more time, do you want to set



your committee meetings at different times?"

Mr. McAlister: "We can give the subcommittee until one o'clock, then the gully control committee will meet promptly in this room at one o'clock."

Mr. Johnson: "The committee on terrace outlet design and construction will meet immediately in the next room."

Mr. Beaman: "The committee on drafting, mapping and photogrammetry will be in room 703 as soon as they are ready. Two of the young men are over from the Stillwater project and I would like to ask them to set in."

Mr. Chambers: "Just a word about your committee reports. In some of these questions it was realized that you could not make definite recommendations. We have not progressed far enough to make definite recommendations but it was hoped that you could arrive at some general recommendations for the guidance of the men on the individual projects. These committees as set up now will act as committees throughout the year. We would like to zone the projects where the conditions are similar. The committees should represent zones instead of the entire United States. Conditions are rather broad to make any definite statements. If we had them in zones we could make the decisions more quickly. Any suggestions or anything concerning these committees? If not, we will meet here again at three o'clock for a final report." Thursday P. M. three o'clock - Meeting called to order.

Mr. Chambers: "We will call on Mr. Overholt to give you a short talk. I spoke to him this morning but he wasn't here. If he is present, we will hear from him."

Mr. Overholt: "When our Regional Director, Cutler, gave me a ride down here with Mr. Johnson, I took him up instantly. I have been glad that I had this opportunity ever since. I have been very much impressed with the earnestness of the men. I have noted with a great deal of interest the amount of careful thought that has been put into the papers. We believe we have a very fine project in Chicago. Mr. Cutler came to the Soil Erosion Service from the Chicago Agricultural Experiment Station and I have worked with him many times during the past 15 years. Many of the men that he has under him are men that I have worked with as county agents or extension workers in the State of Ohio. We thought we had a project up there."



was different but I find that there are 33 varieties of projects over the country. It has cleared up a great many things for me and it has been a pleasure to be with you.

Mr. Chambers: "Thank you very much, Mr. Overholt. Now we come to the important part of our meeting which should be held under Queensberry rules. No fair hitting below the belt. The committees are ready to report. We will turn the discussion over to the Chairman of each committee. We will call on the Gully Control Committee first whose chairman is Mr. J. F. McAlister.

Mr. McAlister: "We had plenty of discussion all right but I don't know how far we got. You will know in a few minutes how little we decided upon. When we began discussions on these various questions, we found we had all kinds of gully conditions represented. Trying to fit recommendations for all these various conditions was almost impossible. We might be getting a start, however. In this gully control business, there has been nothing standardized previously. It made it impossible for us to give very definite recommendations that might apply all over the country. I am going to ask Mr. Ensminger to read the report if it is all right. I think he can do a better job of it.

Mr. Ensminger: "If you have any bricks to throw, wait until I sit down.

Committee on Gully Control - Recommendations submitted:

A. Definitions of terms:

1. Check dams - Structures whose primary function is to establish or maintain stabilized conditions for gradient in gullies or water courses. Other functions are assisting in plant growth and secondary siltation.
2. Soil Saving Dams - Are structures whose primary function is retention of silt.
3. Height of dams - Temporary dams should be low enough that vegetation will be able to stabilize the gully at the termination of the life of the structure. It is not felt that definite rules should be laid down for height of permanent check and soil saving dams, but it should be borne in



mind that hydraulic forces which the structure must withstand increase rapidly with height and that the failure of a high dam is likely to cause more damage.

4. Are check dams always necessary in gully control? - No.

B. Should a correlation be made between quantity of run-off and type of dams - temporary or permanent? - In a general way it may be said that temporary structures should be limited to cases where vegetation can be expected to eventually control the flow.

C. Collecting of hydrological data.

1. Gully control as well as terracing or any other engineering phase of the work of the Soil Erosion Service invariably involves the determination of various hydrological factors, although the Ramser curves have been, and at present are of incalculable value for the engineers of the majority of the Soil Erosion Service projects in designing terraces, weir notches and like structures, there is a need for fitting those curves better to the local conditions of the widely scattered projects. Hydrological data if properly collected on the various areas, together with existing data from the U. S. Weather Bureau stations, will eventually furnish such information as will enable us to safely modify Mr. Ramser's recommendations to fit more closely the local conditions.

In view of the above stated and in view of the fact that the data collected will be of great value in many other ways to the engineering and other branches of the service, the Committee on Gully Control recommends that the collection of hydrological data be extended as much as possible and that a well coordinated standard and uniform procedure for collecting



and analyzing such data be established throughout the work of the Soil Erosion Service.

2. The engineering phase of the work of the Soil Erosion Service is concerned with the design of structures (such as dams, terraces, ditches, etc.) used to control the flow of water and with the determination of probably run-off from various areas.

This work as well as field studies of such problems as the determination of maximum permissible velocities in terrace outlet structures and the like involve an intimate knowledge of hydraulics and hydrology.

The committee therefore recommends that the services of a man qualified to supervise the collection of hydrological data and to solve such hydraulic problems as may arise be available to each project of the Soil Erosion Service.

D. State rules for justifying the cost of gully control work with reference to value of land, improvements, etc.

All gully control work should be placed on a practical economic basis. We hesitate to make definite recommendations as to this basis but believe that, for the guidance of all engineering work, a statement of policy covering the same should be forthcoming from the regional director or his representative on each project concerned. This policy, either general or definite in its scope, should give due consideration to the purpose of the control measure as well as the value of the land and improvement benefited.

In instances where the time element is of no vital concern we also wish to recommend that careful consideration be given to the fact that nature will provide the best and least expensive control of these gullies



when they are protected from overgrazing, fire or undue concentration of run-off.

E. Recommendations for maximum degree of slope on which dams and other structures should be used.

Gully slope is not in itself a limiting factor in the construction of gully control structures. However, it enters into the consideration of the economical and hydraulic factors.

F. Define gullied area treated.

Take an average length of the cross section of the completed gully and multiply by the length to obtain that area treated.

The committee recommends that geographical committees be set up on gully control for the purpose of determining more definitely for their area matters treated in this report as well as additional recommendations.

Mr. Chambers: "You have had the report of the committee. Is there any discussion. Are there any objections to those points outlined. If there is not, I think it is in order to move that they be accepted as they stand."

Mr. Ryerson: "I move that this report be accepted as a whole."

Motion is seconded.

Mr. Chambers: "All in favor say 'I'."

Mr. Chambers: "Opposed 'No'." None

Mr. Chambers: The 'I's' have it."



Mr. Chambers: "We will next have the report of the Committee on Terrace Design and Construction. The Chairman is Mr. John W. Carpenter."

Mr. Carpenter: "Now fellows I am going to read this report. I wasn't as scientific as Mac here. This is the report on Terrace Design and Construction. The committee thought that it would be very inadvisable for us to sit down in the limited time available and try to develop terrace cross sections for conditions throughout the whole United States."

The committee has requested Mr. C. E. Ramser of the Bureau of Agricultural Engineering to prepare standard cross sections of terraces suitable for different slopes and sections of the country based on data which have been obtained by erosion control experiment station and additional data which he has requested from Engineers of the Soil Erosion Service.

Comment: "The Soil Erosion Experiment Stations probably have more data than any other agencies, and we have other results that we can use, which we are going to furnish Mr. Ramser and the whole will be incorporated into these recommendations. Any discussion?"

Question: "Mr. Carpenter will you read these questions as you go along that you are supposed to follow in making your report?"

Mr. Carpenter: "The one I have just read is the one we asked Mr. Ramser to take care of."

Question two is - "Maximum degree of slopes to be terraced on Major soil types."

It is the opinion of the committee that a committee composed entirely of engineers should not make definite recommendations as to the maximum degree of slopes to be terraced on major soil types. It is recommended however that a joint committee composed of engineers, soils,men; and



agronomists of each area make definite recommendations for the soil types in that area.

Comment: "I for one would hesitate to stand up and make recommendations for spacing terraces on the Washington State project and all the other men in the committee felt the same way about it. Any discussion?"

Third Question: - "General recommendations as to vertical spacing and grade."

The committee recommends that vertical spacing and grade be based on recommendations of the Soil Erosion Experiment Stations. Variations being made to suit local conditions which include meteorological conditions and soil types.

Comment: "Now we had rather a lengthy discussion on that and we find that there is some variation in all states but the variation from the old standard of spacing terraces is so slight that for all practical purposes it can be disregarded. Any discussion on this question?"

Fourth Question: "Opinion as to most economical equipment to be used by Soil Erosion Service in constructing terraces under varying conditions found on different projects."

In view of the need for securing balanced equipment, the committee makes the following recommendations.

a. The trend in terrace construction in the past year has been toward longer cross section dimensions. Further study and experience may bring still further changes and development that will call for different equipment than that recommended at this time.

b. At this date, February 7, 1935, cost figures available indicate that a tractor with minimum of 4 d-b H.P. pulling a two wheel terracer



weighing between 4300 and 5000 lbs. and carrying a 9 or 10 foot blade is the smallest unit advisable for normal terrace construction. The wide gauge tractor with a minimum shoe width of 18" and shoes heat-treated is recommended.

c. A Rotary scraper of approximately 30 to 40 cu.ft. capacity is recommended, for use with a 40 d.b. H.P. tractor for this work.

d. A road ripper is recommended for use under some conditions and in normal cases a 1700 lb. to 2350 lb. ripper should be used with the 40d.b. H.P. tractor.

e. Where larger than 40H.P. outfits are required and can be used in larger fields we recommend 4 wheel type road graders of from 7000 to 10000 lb. weight with 10 or 12 foot blades be used with wide gauge tractors of from 50 to 60 d.b. H.P.; and 9500 lb. or heavier graders with 12 to 14 foot blades be used with tractors of 65 or more D.F. H. P.

f. Where rotary scrapers are used with 50 to 60 d.b. H. P. tractors a 50 to 60 cu.ft. size is recommended.

g. Where heavy elevating graders with 42" or 48" elevators are used on larger fields we recommend the engine drivers carrier with a minimum of 45 brake H.P., pulled by a tractor of 65 d.b. H. P. or more.

h. Where gullies are to be filled and banks sloped, tractor trail-builders outfits have done the work at the lowest cost; a minimum of 40 d.b. H. P. for trailbuilder work is recommended.

Comment: "We requested the representatives of the equipment companies who are present to make recommendations. The matter was discussed in open committee meeting and then they met as a subcommittee. We felt that they being familiar with the equipment could make more intelligent recommendations."



tions than possibly we men who are not so familiar with the individual projects. This is the report of that subcommittee and was accepted to be incorporated as a part of our report. It is recognized that under special conditions smaller equipment might be advisable. Is there any discussion?"

Question: "Is it the intention to take the construction entirely out of the farmers' hands?"

Answer: "I wish I knew."

Comment: "That is just what you will do with those recommendations."

Comment: "Read your question again."

Mr. Carpenter reads question again.

Mr. Hill (from Texas): "I realize that, but what is the eventual aim of all this business?"

Mr. Chambers: "The eventual aim of this is to establish demonstrations on the different watersheds. We are not dealing with the problem of building terraces for the farmers here, there and everywhere. We are not in the same position as the F.E.R.A. If we expand it may be under conditions where the farmers will have to pay for it but on these demonstrational areas we are building with his cooperation. In most every project he is required to do some part of the work but on these demonstrational areas we are using Government funds in actual labor of building those terraces. We are trying to find out the most economical way of doing this."

Comment: "You understand there are two or three who are not using any of this equipment but they have different conditions."

Mr. Chambers: "yes."

Mr. Carpenter: "Chambers, in order to satisfy Mr. Hill and some of these other fellows who already have these previous arrangements, how would it do to, if it is satisfactory with the rest of the committee, insert the



recommendation to the effect that such conditions do exist."

Mr. Chambers: "I think we should, and probably the statement that small types of equipment should be furnished in order to teach the farmer the proper use of that equipment in order that he may construct his own terraces."

Mr. Glass: "If we are going to answer that question, let's answer the question. I don't believe we should make it a practice to teach anyone to do it the most laborious way he can get it done. I refuse to have any part in making recommendations to a man that a job can be done when it is at a cost from 3 to 4 times more. I don't believe terracing a farm is an individual landowner's proposition and I think we are making a big mistake in teaching that another method can be used if it is not economical. We, as engineers, would be belittling our position to recommend that the job be done by anything else but the heavy equipment."

Mr. Chambers: "I would like to make myself clear here. What I meant was that we do have cases where farmers want terraces and we don't build them right away or he is not where he can get cooperative assistance on them. In that case I believe it is a good idea to have some small equipment and to show them how to use it. I agree that it is the most laborious method. I have been to the bat about the heavy equipment on several occasions. I am thoroughly sold on the heavy equipment as the most economical we can use but I thought it would be the proper thing to do to have some of the smaller equipment and teach these isolated farmers the use of it."

Comment: "As I understand it, the work is to be carried on by the farmers after our work is through."



Question: "Should we teach the farmers that it can be done with small equipment or should we begin an educational program now?"

Comment: "They don't use it themselves they hire it done."

Question: "Would it be cheaper for the farmer to hire this big equipment. He is hiring it done in a number of places in our particular area. I am of the opinion that it would not be practical for the average farmer to build his own terraces."

Comment: "Conditions vary."

Mr. Evans: "I make a motion that this recommendation be accepted as it was first read by Mr. Carpenter."

Motion is seconded.

Mr. Chambers: "You heard the questions and discussion on this recommendation made by the committee as a whole. All in favor of accepting it as first read signify by saying 'I'. Opposed 'No'. The 'I's' have it."

Mr. Carpenter: "There were a number of questions raised in the committee that the committee ruled out of this report. One of them being the fact that in some sections of the country more flexibility is needed in the terracing machine. In some sections we need a machine to use in tearing down old terrace ridges. We thought it should take more of an informal request to the machinery men present. Another thing was the standardization of hitches on tractors. We find in some instances that terracers made by one company will not hitch with tractors made by another company. We would like to ask you gentlemen of the equipment companies to get together on that. It seems to be a matter of pin holes."

Fifth Question: "To what extent should cooperators be required to



participate in terrace construction? Is the Soil Erosion Service justified in undertaking all the work without assistance from the cooperator? Make definite recommendations."

It is the opinion of the committee that no definite requirements as to the specific amount of work to be performed by the land owner can be laid down due to varying conditions and degree of education on erosion principles, but that some definite cooperation should be required. This required cooperation may vary from contour farming and maintenance, in sections where terracing is newer to complete construction of the terrace in some of the older terracing sections."

Comment: "That is all the committee felt that they were justified in recommending as a definite recommendation. Is there any discussion. Shall we vote on that? Anybody want to argue about it."

Comment: "Let's go on through and then adopt the whole thing."

Sixth Question: "Should reclamation of sub-marginal land be attempted under any conditions by constructing terraces?"

The committee is of the opinion that submarginal lands should be terraced under certain conditions similar to the following.

- a. Where silt from submarginal lands is damaging low lands, streams or reservoirs.
- b. Where small areas of submarginal land occur in large fields of productive lands.
- c. Where gullied areas can be more economically and effectively controlled by terracing than by other means.
- d. Where terracing is necessary or advisable as an aid in the es-



tablishment of vegetative cover.

e. In instances where the first stages of gully erosion have caused the land to become submarginal but where terracing and the proper cropping systems will return the land to a marginal state at reasonable cost and in addition will prevent the complete destruction of the land.

f. In cases where the entire farm or a large portion of it is in a submarginal state, where there is a reasonable possibility of reclamation by erosion control and cropping systems and where no other provision can be made for the farm family.

Comment: "Any discussion?"

Seventh Question: "Should terraces be constructed by S.E.S. on watershed demonstrational projects where cooperators do not or will not practice contour cultivation. If so, should the cross-section of the terrace be modified."

It is the opinion of the committee that terraces should not as a rule be constructed on watershed demonstrational projects where cooperators will not practice contour cultivation. It is recognized by the committee however that in some of the areas where erosion control methods are little known, that demonstrational and educational work is necessary and that under these conditions, it may sometimes, on moderate slopes be advisable to allow flat cultivation across the terrace.

It is the experience of members of the committee that farmers, after a period of years, will of their own accord adopt contour farming due to maintenance costs and increased yields.

When the terrace is to be crossed in cultivation it is necessary that the terrace be built both wider and higher than when contour cultivation is practiced.



Mr. Carpenter: "Any discussion?"

Eighth Question: "Recommend practical methods of maintaining terraces and to what extent the Soil Erosion Service should go to educate cooperators in maintenance methods."

It is the opinion of the committee that when the proper plowing method is employed little maintenance by other equipment is necessary. Plowing should be done in such a way that the cross section of the terrace and water channel will be maintained or improved. The success of the terracing program depends among other things on proper maintenance. Any educational methods necessary to accomplish this end should be used.

Mr. Carpenter: "Any discussion?"

Ninth Question: "Is the Soil Erosion Service justified in constructing terraces that do not have an appreciable factor of safety?"

It is the opinion of the committee that the Soil Erosion Service is never justified in building terraces that do not have an appreciable factor of safety.

Mr. Carpenter: "Any discussion?"

Mr. McAlister: "Does that refer to the units we talked about?"

Mr. Carpenter: "That refers to any terrace built or supervised by the Soil Erosion Service."

Mr. Chambers: "I think we find that where a terrace is constructed on our project, it is our terrace - that is if it breaks."

Tenth Question: "Outline of reports necessary for a project. Recommendation as to the maximum cost of survey and checking on terracing work."



It is the opinion of the committee that there is not sufficient time available to make intelligent recommendations in regard to an outline of reports necessary for a project. Due to the importance of this phase however it is felt that a committee should be appointed to make reports at a future date. It is felt that SES reports and reports for ECW projects on SES work should be closely coordinated.

Mr. Carpenter: "We went into this question pretty well and we thought it would be ridiculous for us to try to handle a subject as big as that in the time available. Any discussion?"

Eleventh Question: "Considering that Soil Erosion Service watershed projects are purely demonstrational, are we justified in doing more work on construction, finishing, filling low places and seeding terraces than would be necessary were the cooperator constructing them?"

It is the opinion of the committee that the Soil Erosion Service in terracing a farm should leave a finished job but that the Soil Erosion Service should not do more on these demonstrational projects than the farmer would do were he constructing them - and he also should do a finished job. It is the further opinion of the committee that the farmer should be required to do everything possible with his available resources.

Mr. Carpenter: "Any discussion?"

Mr. McAlister: "Does that mean we should complete a farm when we go on it"

Answer: "We should complete a terrace."

Mr. Carpenter: "There was one thing that we did not include in our committee report but it received quite a bit of discussion and there seemed to be a very general sentiment that we request the Soil Erosion Service in



Washington to put on an extension agricultural engineer to go from project to project studying conditions and passing them on to the other fellows. We felt that it would be well worth while and we would like for you to take that under consideration Mr. Chambers."

Comment: "We have two other recommendations that we would like to put before the committee as a whole. It is recommended by the committee that due to imperative need for information as to just what the various vegetative covers will stand in water flow, especially in terrace outlet ditches; investigational work, looking toward the solution of this problem be started immediately. It is further recommended that each project have at least one man on its staff who is capable of gathering and handling hydrological data. 13. The committee recommends that both from the standpoint of cooperation with the highway departments and protection of the individual farmer definite ruling against the emptying of terrace water into highway ditches be immediately put into effect. Any discussion?"

Comment: "I would like for you to read the recommendation on Question Seven again.

Carpenter reads No. 7 again.

Comment: "I don't believe that they should ever be allowed to cooperate unless they plant on the contour."

Mr. Carpenter: "That was the first reaction of the committee. After some discussion, the point was brought out that in some areas like the north where terracing is unknown it would be extremely difficult for them to get any terracing done in the particular sections where they have check row cultivation."



Comment: "If they cultivate over the terrace, they are going to get breaks in them."

Comment: "I never was in a territory where they used it altogether in flat cultivation."

Answer: "They do in some localities."

Mr. Carpenter: "Any further discussion?"

Mr. LeMert: "I come from an area where farmers do not know much about terracing and when we put them in there is a strong inclination to go ahead and farm as they have in the past. I personally do not know how it will work out. I do believe they will try it a year or two and decide that contour farming is the way to do it."

Mr. Ryerson: "Up in these northern territories, as was stated, we have a lot of areas in which terracing is entirely unknown. Those farmers have been using check rows for their corn. The problem is in convincing them that it is not the thing to do to check row corn. They remember when it has been too wet in the spring to cultivate as soon as they should and are firmly convinced that check row cultivation is especially necessary. In those areas if we insist on contour cultivation we won't get any terraces. We want to get them terraced and if we will build the terraces on moderately sloping land and require them to plow those terraces as we recommend they are not going to do a great deal of damage to the terraces in the cultivation of the corn as they do it up there. And in a good many cases they will become convinced that contour cultivation is not so bad after all but for us to go in there insisting upon it we are not going to get the idea across and they won't know what it is and we might as well stay out."



Comment: "We must insist upon the value of contour cultivation. That is one of the primary principals in soil erosion control work to support the practices of cultivating on the contour. It seems to me that we have recognized that and it is one of our purposes to carry out that practice. The only way we will get it established is to demonstrate the right thing to do. It seems to me the idea of contour cultivation should be uniform on all land and not permit changes from one project to another. The policies of the Soil Erosion Service should be uniform in all sections of the country. It is our job to carry out those things on our project. I am not trying to criticise anyone but I feel we should carry those things into actual practice.

Mr. Ryerson: "We are not denying that contour cultivation is the thing to do. We do not accept any farms on which contour farming is not practiced. We do have many farmers that are refusing to come in if we insist on contour cultivation. Now on those farms are we not justified in terracing that land with the hopes, reasonably supported, that they will practice contour cultivation after they have had the terraces for a few years. We can get them to plow on the contour but not plant their corn and drill it on the contour yet. I feel that we are helping the erosion control problem if we build the terraces there. That is just my personal reaction to that and personally I will do all I can to insist upon contour cultivation but I know there are areas we won't get until the farmers realize our problems."

Mr. Ensminger: "Up in Illinois we have just about the same situation. We won't say we won't permit them to go across the terraces but in no



case are our men advocating anything but contour farming but they are used to check rowing and it is a pretty hard proposition. We are just telling our men and getting it as quick as we can."

Comment: "We write into the contract that they must contour farm but a great many of them are plowing over the terraces whether you want them to or not but I don't think the Soil Erosion Service should sanction it. I know what your problems are. Your check planting is going to be a drawback. Until you teach the farmer to drill his corn on the contour, you are going to be up against that thing but we should not sanction it."

Comment: "We think that education should be carried out to the fullest extent where necessary and I think we adopted that plan."

Comment: "I suggest we take a vote on that."

Mr. Glass: "We just have a part of Ryerson's and the Illinois boys difficulties. Any of you who work in a sectionized country have the problem of straight rows. We don't check list crops however. We list our row crops in our area. We had this agreement that a man would farm the land on the contour and I don't agree with the gentleman over here quite as strong as he made the statement. Possibly there are a few men that will not do as they say they will but generally speaking most men try to do the best they can in living up to their word. We had only 78 farms last spring on which we had terraced fields to be planted to corn. We assisted 71 of these farmers to get this crop put in on the contour. We drove the tractors and teams in some cases when he couldn't do the job at all. In other cases we assigned 4 or 5 to one man and during the time we were listing corn that individual contacted that farmer at least once a day while he was on that job. Every one of those farmers appreciated that



immensely. When they got through with those jobs those fellows expressed their appreciation for the assistance that our fellows gave on that job. Now what became of the other 7 men? We were lenient to the extreme. Only two of them attempted to put in straight row crops over the terrace. Those two men have talked to me more than twice this fall and made up their minds definitely that they were wrong and that we were right. They came to that conclusion after going contrary to our recommendations. We had one midway job, sort of, where we selected a key terrace to which there were several on the area reasonably parallel to it and permitted them to wabble their rows over it. You just want to try that just once. I came pretty nearly getting as good a licking as I ever got in my life when I came up on the fellow when he was trying to tip that lister up on its wheels. He pulled up his pants leg and showed me his leg with no hide on it and it was not a hard job to show him that we had been trying to be good to him. We have some counties with 5000 or 6000 acres of terraced land where they hired the equipment to do the terracing. They got the equipment from the road building company and rented about 60 caterpillar tractors with 12 to 14 foot blades for from \$5.00 to \$7.50 per hour and built those terraces. We told them how to maintain them and how to put in their crops. I have been told more than once that these terraces were all right but you can't tell them that they can keep corn clean without check rowing it. One of the best ways of convincing them is to just get one good hard rain and call the neighbors out and show them what happened. Show them a farm that has been planted as it should be and then show



them one that hasn't. You will see that from then on they will plant it as it should be planted. You can't convince them by arguing with them but when you can show them on a piece of their own land or on their neighbors land, they will see their mistake. I believe we have a lot of teaching to do.

Mr. Edmiston: "It is not a question of what is the best practice. The gentlemen all recognized that the best way is contour farming. When we were discussing that yesterday afternoon, I was the first one to say 'Nay'. I would not want it in Louisiana but we did feel that we were justified in putting in that clause for those areas where it is necessary to do some educational work in order to get the program established."

Mr. Carpenter: "Any further discussion. Shall we read this again? Those in favor of adopting as read, say 'I'. Opposed, 'No'. (Two Nos) The 'I'S' have it. Are there any other points that should be brought up gentlemen?"

Comment: "There were a number of sections that were not approved."

Mr. Carpenter: "All in favor of approving the Committee's report as a whole signify by saying 'I'. 'I' Opposed, 'No'. The 'I' have it."

Mr. Chambers: "We will next hear from the Committee on Terrace Outlet Design, Construction and Protection. Mr. Johnson is the Chairman. Mr. Johnson could not be here and Mr. Cook will give the report."

Mr. Cook: "Our committee did not follow the questions as outlined. The recommendations that we have are in quite rough form and we would like time to polish up these recommendations before they are published.  
1. This committee recommends the following as an outline of the proper procedure to be followed in the design of terrace outlet channels.



- A. Base the design upon the maximum rate of runoff likely to occur, on the average, once during each ten year period.
  - B. Design a channel of sufficient capacity to pass this rate of runoff when the channel lining has attained its ultimate condition; this design to be based upon some recognized formula such as Kutter's or Mannings.
  - C. Determine the velocity of flow that will exist in the channel so designed.
  - D. If the velocity is found to exceed that considered permissible for the proposed channel, investigate the possibility of broadening the channel as a means of reducing the velocity to an allowable figure.
  - E. If no feasible broadening of the channel will bring about sufficient velocity reduction, then permanent protection of the channel by suitable structures must be provided.
  - F. If it is proven that permanent protection is not required a further computation shall be made to determine the maximum velocity that could exist in the channel when new, or in such condition as would cause the flowing water to attain its greatest velocity.
  - G. If the velocity in the new channel is found to exceed the adopted permissible velocity suitable temporary structures shall be provided to protect the channel from excessive erosion until it has reached its ultimate condition.
2. The committee recommends that the expedient of constructing abnormally broad and shallow channels in order to produce low velocities be employed with discretion. Specifically it recommends that the ratio of bed width to



maximum depth of flow not exceed a value of ten or twelve for channels not protected by permanent structures. When permanent spreaders are installed these values may be exceeded, but it is suggested that careful consideration should precede such a step.

The committee urges that field engineers avail themselves of every possible opportunity for careful observation of the flow of water in shallow channels on steep slopes. In addition to improving the judgement of individual engineers in relation to the proper use of abnormally shallow channels, such observations will tend to crystalize the attitude of the entire service on the subject.

3. At the present time the committee does not feel competent to recommend specific values for permissible velocities in channels in various types of soils and protected by various kinds of vegetative cover. It is the opinion of the committee, however, that velocities exceeding 5 feet per second should never be allowed in channels protected only by vegetation. Moreover, attention is called to the fact that only the very best of sod is capable of sustaining these velocities and that it will do so only for floods of short duration. It is also the opinion of the committee that a maximum velocity of 5 foot per second should not be exceeded in unvegetated channels in ordinary loam. The same upper limit of velocity is recommended for channels in such soil when the vegetative cover is sparse.

4. The committee recommends that the Soil Erosion Service establish field experiments designed to supply information on erosion caused by the action of running water in channels; such experiments to be set-up with a view to gaining knowledge of the erosivity of various major soil types under different velocities, the protective power of various types of vegetative



covers, etc. and with the further objective of obtaining other hydraulic data that would assist in designing protected channels, dams and other erosion control structures.

5. When it is found that permanent protection of a channel is required, the committee recommends that cost estimates be made covering all feasible methods of protection in order that the adoption of the most economical means of protection may be insured.

6. The committee urges that special care be taken in the hydraulic design of channels and recommends that on each project a properly qualified engineer be delegated to check the hydraulic design of all channels and structures before they are constructed.

7. It is the opinion of the committee that, in situations where serious damage might arise the failure of vegetation to continuously control erosion of outlet channels, careful consideration should be given to the advisability of placing dependence upon vegetation alone. In this connection it is suggested that thought should be directed along the following lines:

a. The cost of repairing the channel if the vegetation fails to function as expected.

b. The cost of such repair as compared with the additional cost of initial protection of the channel by permanent structures.

c. The psychological effect of possible failures upon the farmers on the area and upon other observers of the work of the Service.

8. The committee recommends that it be the policy of the Soil Erosion Service not to empty terrace water directly into highway ditches. The committee further recommends that the final disposition of the water from



a system of terraces be investigated to ensure a safe transmission of the runoff to a satisfactory and permanently stabilized waterway.

9. Where long terraces are used it is recommended that terrace channels be brought into the outlet ditch from both sides and protection provided by the construction of a single structure.

10. The committee recommends that in the construction of outlet channels a drop of 4 to 8 inches be allowed at the end of the terrace channel where it enters the outlet channel.

11. It is recommended that a permanent committee on terrace outlet channels be established to gather, correlate, and make generally available to all projects, information bearing on the design of outlet channels.

Question: "One question, taking into consideration hydrological design of those terraces, has any consideration been given to the maintenance of those channels. These channels are not going to have water going through them continually."

Question: "I am wondering if when this was taken up it was emphasized that it would be a good practice to establish terrace outlets a year ahead of time."

Answer: "That was not included in the recommendations."

Question: "I should think that the proper hydrological design of the terrace outlet channel can be made a year before just as well as when the terraces are put in. It is well to establish that channel as far ahead as possible and for myself I don't see any rational soil erosion control program that will be for six months or 18 months or two years. I don't care whether it is the Soil Erosion Service or any other service



or the farmers themselves, if the land is terraced, it should be a long range business. We may as well include that as a rule. Our areas should look ahead and establish its channels before the terracing is done.

Mr. Cook: "Mr. Chambers, there seems to be several people that would like to have a recommendation of that sort and if the committee has no objections we might add that to our recommendations."

Question: "What is it again?"

Answer: "That the channels be constructed a season in advance of the construction of the terraces."

Mr. Chambers: "If there is no objection, I see no reason why it should not be included."

Mr. McAlister: "I would like to ask the committee to make a suggestion as to the height of the channel in comparison to the terrace channel."

Mr. Cook: "We were very much rushed. We tried to come to some conclusion on that but did not have time. Perhaps that is one thing that should be brought before the meeting."

Comment: "I would suggest that we accept Mr. Ramser's recommendations on that not to exceed 8 inches."

Question: "Is that a maximum? Is there any minimum? Should we ever build the terrace channel level with bottom of the outlet channel?"

Mr. Cook: "That question was raised in the committee. No decision was made because, would it not sometimes be advisable to install special structures to provide any desired drop at that point?"

Comment: "I wonder if Mr. Ramser's recommendation does not suit this."

Comment: "Give us the wording of the recommendation."



Mr. Cook: "It is the recommendation of this committee that the relative elevation of terrace outlets to terrace channels be that as recommended by Mr. C. E. Ramser, which falls within the limits of from 4 to 8 inches."

Mr. Chambers: "Any objections to that being included?"

Question: "Do you mean that we strictly follow the recommendations?"

Comment: "That difference in elevation is to allow vegetative cover. You are going to have conditions where you are bound to have more than that."

Mr. Chambers: "As I understand it the results of these committee reports are not absolutely final but should act as a guide to all project engineers in the Soil Erosion Service. If he goes contrary to these recommendations, he should be able to justify his actions."

Question: "May I ask a question? Could those channels be designed to permit the operation of a machine to keep it clean and also have the channel designed so that it can be crossed with farm equipment? Mr. Cook stated that the channel should not be spread out too much to get a low velocity."

Mr. Cook: "There is no objection to low velocity. We just can't get low velocity on steep slopes. I tried to make that clear. As to the maintenance of the channel, I believe it was the opinion of the committee that the first thing is to get a channel that will handle the water successfully. The maintenance of the channel is a thing for the engineer who designs the channel to settle."

Question: "Did the committee give any consideration to the horizontal spacing of spreader boards?"



Mr. Cook: "The committee spent a great deal of time talking about that, but it is not ready to tell anyone else how to do it."

Question: "Would you mind reading the recommendation in regard to one dam where two terraces come together?"

Answer: "I was wondering if that should be the single structure wherever possible. On a deep ditch and a large acreage coming into it maybe the notch in the dam would be 3 feet deep and the grade line coming into it at a depth of about 3 feet above that. In that case you would have to have a check in your ditch and also an outlet in each terrace."

Mr. Carpenter: "I would like to have Mr. Douglass to answer that question."

Mr. Douglass: "Instead of building the V type structure, we extended the excavation back behind the notch and made a kind of drop, what we call the U type construction."

Comment: "Is it not a matter for the engineer to settle?"

Question: "Is it the wish of the Committee?"

Comment: "Where possible be guided by those recommendations."

Comment: "Where long terraces are used, it is recommended that terraces be brought into the outlet ditch on both sides and protected by a single structure."

Mr. Chambers: "You have heard the recommendations of this committee any further discussion?"

Comment: "We should not lose sight of the fact that this is more or less demonstrational. There is coming a time when all this engineering work will require maintenance and for that reason we should make them as simple as possible. If we make our recommendations simple, it will be a whole lot better on the program as a whole."



Mr. Chambers:

"It has been suggested that we include in these recommendations that "These structures be as simple as possible". Any further discussion on this committee report? Are you ready for the question? All in favor of approving this report as read, let it be signified by saying "I"; opposed, "No". The "I's" have it.

We will now hear from the committee on Drafting, Mapping, and Photogrammetry. The Chairman is Mr. W. F. Beaman."

Mr. Beaman:

"The committee has taken the problem up as a whole on the projects and the Washington office as one unit. We have not followed the outline, but have taken these questions up in the line of importance. I am going to ask Mr. Jepson to come up and read these off and we will discuss them one at a time as they are read. We have attempted to include all the various points."

Mr. Jepson:

"The Committee on Drafting, Mapping, and Photogrammetry after careful consideration do hereby respectfully submit for your consideration the following recommendations to improve the work of the various drafting rooms:

First; Responsibility for drafting work.

To place all drafting and mapping to be done by draftsmen under the supervision of the Chief Engineer on the respective projects."

Question: "Does that include soil maps?"

Answer: "That includes everything. In case a project has a Chief Draftsman, he would be responsible, but he in turn would be responsible to the Chief Engineer. That was the point to be brought out."



"Second; coordination between project areas and the Washington office.

That a permanent representative be appointed from the Washington office to visit the various project drafting rooms to study their problems and to aid them in carrying out the recommendations of this committee as well as to furnishing to them the various information which he has accumulated from these contacts and to aid them in securing special drafting equipment.

Third; standardization of symbols and sizes.

Along the lines mentioned in Number 2, from the information secured by these contacts as well as information secured from the drafting rooms of other Government agencies, that a set of standard symbols, conventional signs, standard size maps, and other standard practices, be compiled that will be adaptable for all Soil Erosion Service drafting work.

Fourth; employment of qualified draftsmen.

That in the future in hiring of draftsmen for the various projects that a system of examinations be followed to determine drafting ability in conjunction with the consideration of experience similar to the method now used by the Washington Office."

Question: "Just what procedure do you follow in Washington?"

Mr. Beamon: "In the Washington Office we ask for a list of eligible draftsmen just like you do. They send us a list of men to pick from who are located at various points over the United States. It is impossible to give them all a personal interview. We study their experience on their application and then send the best trained ones, or those whom we think can do that particular type of work, an examination which is to



determine the grade of their particular work. When the sample is returned to the Washington office, they are given a rating. Each man is allowed a total of 10% on the time required to do this work, 20% on the line work and neatness, 20% on the lettering and of course we have some problems that require judgment. We do not want a draftsman that we have to supervise all the time so we allow 10% for the judgment shown and then for the experience this man has had we allow 40%. If a man does not make at least 70% he is disqualified and we return his papers. Education is taken into consideration with experience. 10% on time it takes to complete the sample, of course we have to take his word for this. The applicants are made to understand that if after they are hired and their work does not measure up to the sample they turned in as their work, they will be fired. Formerly there was no way of giving an examination before the eligibles were hired. I think that this is the best method that we have been able to work out. We have 35 men in the Washington office and from the amount of work that we have to do, we need 100.

Fifth; Exchange of information among projects.

Every Soil Erosion Service project shall submit to the drafting department of the Washington office, copies of maps, construction details, prints of labor-saving devices, and such other devices which may be of benefit to other projects in the Soil Erosion Service. The Washington office shall file such informative material and shall act as a clearing house to resubmit it to the projects that may benefit therefrom. Due credit shall be given to the project or individual originating the information submitted.



Sixth; obtaining reproductions from the Washington office.

Wherever a project finds it inexpedient to make reproductions from drafting work due to lack of facilities or equipment, it may submit such work to the drafting department of the Washington office. Such work required shall be anticipated as far in advance as is possible in order to allow the Washington office to have this work reproduced in the proper manner.

Seventh; recommendations for photogrammetry.

(a) Contact prints shall be on double weight semi-mat paper and at a scale of 1:20,000. The enlargements from the contact negatives shall be of sufficient number to cover the entire area on double weight extra fine grain surface absolute mat, the scale to be 500' to 1".

(b) On one set of the enlarged pictures, match lines will be superimposed by the Washington office and these match lines will follow the lines of prominent features to aid the field men in matching adjoining pictures. Enlargement negatives shall be furnished to all future projects for the purpose of making therefrom, blueprints to be made by the individual projects for use in making cooperative agreements.

(c) Planimetric base maps at a scale of 4" to 1 mile will be compiled by the Washington office for the smaller projects. (The larger projects being a special problem, will be taken up individually.) The Washington office will send a man to the individual projects to run the necessary geodetic field control for compiling the planimetric map and the project will furnish the necessary personnel and assistance to secure this data.



(d) At the proper time, the Washington office will submit to the project a separate set of aerial survey enlargements on which the project will identify the necessary farm boundaries and other pertinent information deemed necessary on that base map. After the preliminary base map has been made by the Washington office, a copy will be sent to the engineer of each project for his final check. After copies of the enlargements, with the various basic data thereon, namely: Erosion data, soils data, etc., have been returned to the Washington office, this information will be superimposed on individual base maps for each separate phase of the work. After all this information has been secured and the planimetric map has been completed a control mosaic will be made therefrom, a copy of which will be furnished each project as an accurate permanent picture record of the project area before erosion control work was started.

(e) Before advertisements for bids for aerial surveys are let on large western areas, regional officials shall be consulted as to the type of aerial surveys that are deemed necessary by him.

Eighth; As a supplemental recommendation, it is suggested that all cost accounting pertaining to engineering construction work shall be kept under the direction and supervision of the Chief Engineer of the individual projects."

Mr. Beamon: "We realize that the last recommendation had nothing to do with drafting. As the question came up we decided to make a recommendation and have the discussion here so that it would be a separate part from the report of the committee and not shown as a part of their report."



Comment: "Would it be better to vote on the first 7 as being submitted by the drafting committee and No. 8 adopted as a whole body in this meeting?"

Mr. Chambers: "It never occurred to me that anyone would keep our records but ourselves."

Comment: "In answer to that it has been assumed that on some of the projects the records were not kept under the direct supervision of the Chief Engineer and that is the reason the recommendation was made."

Mr. Chambers: "Is there any discussion?"

Question: "What will the title of the man who is going to keep the cost accounting be?"

Answer: "He will be under the supervision of the Chief Engineer in each project but he would do clerical work entirely, so consequently he would have to be classified accordingly."

Comment: "It was my opinion that it would be up to the Chief Engineer to designate that man."

Mr. Chambers: "It makes no difference what his designation is just so long as he is working for you.

We have heard the first seven recommendations of the committee."

(Motion made that the first seven recommendations of committee be accepted) (Motion seconded)

Mr. Chambers: "It has been moved that the first seven recommendations be accepted. All in favor of this motion say "I". Opposed, "No". The "I's" have it. The eighth recommendation that this committee made is to be recommended as coming from this body as a whole."



Question: "Should this man be an engineer trained for engineering? We might include that he be an engineer if possible. One of the engineering trainees would be well qualified. If he is classified as a clerk the Chief clerk would want to direct his work and I don't want any Chief Clerk mess-ing around with my cost records."

Comment: "I suggest that we don't get too much title. I have an office boy that is a mighty good bookkeeper and keeps my records just like I want them kept and I would hate to lose him."

Mr. Chambers: "I don't think we are trying to create a new job at all. We have this position filled by a man at every project. It happens that in some cases the engineer is not directing his activities. This recommendation is to put this man under the engineer's direction. He is working for the engineer and certainly the engineer should have supervision of the job."

Comment: "He should be in the engineer's office so that he could understand more clearly the engineering bookkeeping records."

Comment: "I move that we accept this 8th recommendation as a body as was read."

Comment: "I second the motion."

Mr. Chambers: "The motion has been made and seconded that we accept this 8th recommendation as a body. All those in favor say "I". Opposed, "No". The "I's" have it. Mr. Krimgold wants to make an announcement."

Mr. Krimgold: "If any of you want any information that we can give you in Washington, please feel free to write a letter addressed Soil Erosion Service, D. B. Krimgold, and when you state your problem please go into detail as to what you want to know so that I can give you a



specific answer so that we will not have to write back and forth trying to arrive at the right answer. There will probably be cases when I will not be able to answer the problem myself. I will go ask my Chief if I cannot answer the question."

Mr. Chambers: "Any other announcements?"

Mr. McAlister: "I would like to make the statement that there were some inspectors that have come to my attention recently in looking into the future of our work. There were two geologists spent almost a month on our project studying it and made quite a lengthy report to the Director in Washington on some very weighty matters. There were two things in their report that affect engineers. I wanted to mention them. They looked over our project but I didn't know what they were writing up until after we got a copy from Washington which stated that we were making two gullies where only one existed before. The point they were trying to make was that the gully floor we took it out of had less slope than the one we took it down. The point they overlooked was that we had to drop this water 27 feet to get to this lesser slope. What I am trying to get at is those reports are going around and we may get criticized. The other thing they mentioned was that we were putting up engineering structures on private land that would require engineering maintenance. They doubted the advisability of our doing that. How are we going to control without using engineering structures along engineering lines I don't know. I don't know that they visited any other projects. Seems to me we get most of the people visiting that make up reports. We have been reported quite a bit. Those are just two thoughts that I mention. Another thing is about this F.E.R.A. terracing program. There is some possibility that we might be



quoted in that work as building terraces like the Soil Erosion Service. This question was discussed at Athens last week. We might get credit for some work that we do not have anything to do with. These are just thoughts as we are about to leave this meeting."

Mr. Chambers:

"Anyone else have any announcements?"

Mr. Raney:

"I have one. I am wondering if we get all the cooperation from our Chief Clerks that we are supposed to get. I assume that the Chief Clerks are to settle most of our financial set-up, but any information he gets about our equipment we should certainly know about. I had some graders show up the other day that had been ordered sometime in April of last year. We canceled the order by telegraph about two weeks ago because in the meantime we had decided that we did not want them at all. He had that information about three months ago but we knew nothing about it and now there is nothing to do but to use them. In other words, are we getting to the point, in some cases, where the Chief Clerk is taking too much the attitude of running the whole project?"

Question: "How soon will the reports on this meeting be available?"

Mr. Chambers:

"It will probably be a month or six weeks. This report will be mimeographed and sent to you. It will take these young ladies some time to get the transcript in and our facilities are not the best in Washington. These committees will be in permanent standing until the next meeting. You may have questions referred to you from time to time."

Question: "Is the procedure in carrying on these committees that any time a question comes up it will be submitted to the Chairman of the Com-



mittee and he in turn will submit them to the members of the committee and if it is approved it will be sent out to all the projects?"

Comment: "In connection with the C.C.C. camp work nothing has been said toward educating these boys. Some effort should be made to acquaint them, as much as possible, with the real aim of the Soil Erosion Service."

Answer: "Educational programs are being held on most of the projects for the C.C.C. camps. Members of the staff are holding meetings and giving lectures on activities and methods of the Soil Erosion Service."

Mr. Jepson:

"I move that we extend a vote of thanks to Dr. Winters and the two stenographers for the fine cooperation and assistance they have given us in every way on this meeting. Let's give them a rising vote of thanks."

Mr. Carpenter:

"I don't think I ever attended a meeting that went over more successfully and more smoothly. Mr. Chambers has handled this very nicely and I move that we give a rising vote of tharks to Mr. Chambers for this very fine meeting."

Mr. Chambers:

"It is nice of you to do that. I just hope the meeting has been a success. Personally, I think it has been a great success. Some of these questions that you have raised, and that have been considered by the committees, we have to meet constantly in the field and there is a great deal of satisfaction to me, and I know there is to you, to meet and thrash things out and have an opinion on them. I have enjoyed every minute of this meeting. So far as I know our business is over and we are ready to adjourn. I want to express my appreciation to all of you for your fine spirit of service and enthusiasm. I never saw any group have any more than you have shown at this meeting."

Meeting adjourned.

